CITY OF STOCKTON

PUBLIC WORKS DEPARTMENT

PROJECT MANUAL

FOR

NEW STOCKTON CITY HALL RENOVATIONS & RELOCATION PROJECT

PROJECT NO. E016015

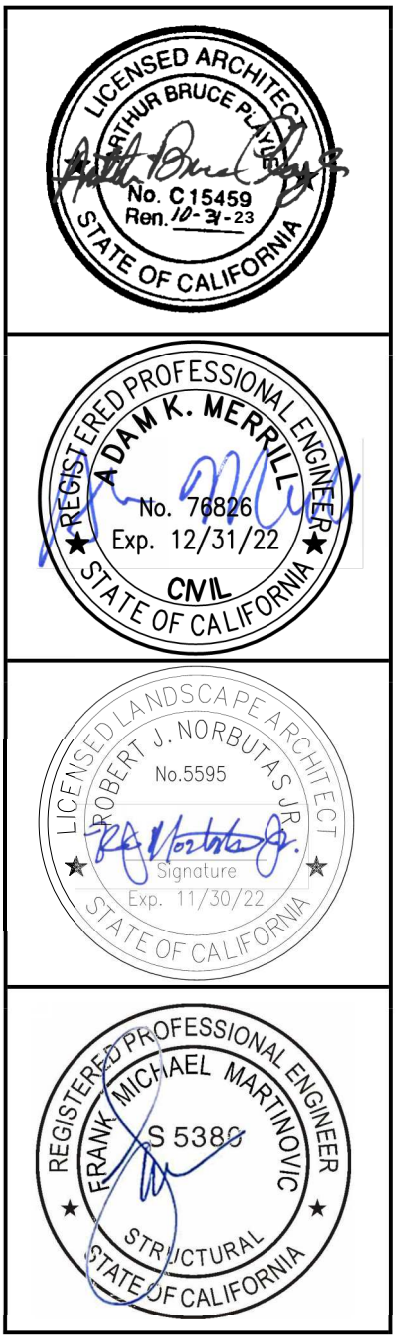
BID OPENING: Thursday, February 10, 2022, 2 PM

SECTION 00 01 07

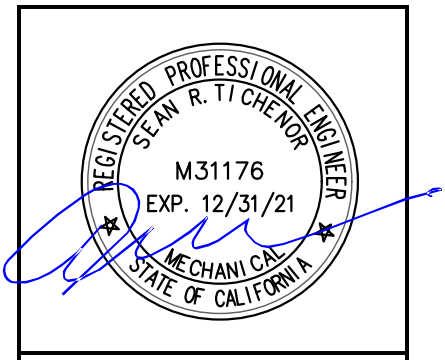
SEALS PAGE

1.1 DESIGN PROFESSIONALS OF RECORD

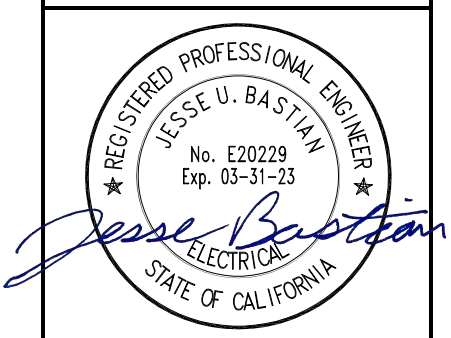
ARCHITECT	**Bruce Playle** **Indigo / Hammond +Playle, LLC** **License #C15459**
CIVIL ENGINEER	**Adam K. Merrill** **Siegfried** **License #76826**
LANDSCAPE ARCHITECT	**Bob J. Norbutas Jr.** **Siegfried** **License #5595**
STRUCTURAL ENGINEER	**Frank Michael Martinovic** **Siegfried** **License #S5380**



MECHANICAL PLUMBING FIRE PROTECTION ENGINEER	**Sean R. Tichenor** **Peters Engineering** **License #M31176**



ELECTRICAL ENGINEER	**Jesse U. Bastian** **M. Neils Engineering, Inc.** **License #E20229**



SECURITY AUDIO VISUAL	**Ali Mortazi** **Guidepost Solutions** **License #E20334**

END OF SECTION 00 01 07

This page intentionally left blank

SECTION 00 01 10

TABLE OF CONTENTS

END OF SECTION

This page intentionally left blank

SECTION 00 01 15

LIST OF DRAWING SHEETS

VOLUME 1

GENERAL

G-001	COVER SHEET (VOLUME 1)
G-002	PROJECT INFO (VOLUME 1)
G-003	ACCESSIBILITY DETAILS
G-101	CALGREEN CHECKLIST
G-102	CALGREEN CHECKLIST
G-103	CALGREEN CHECKLIST
G-201	FIRE LIFE SAFETY PLAN - FIRST FLOORS BLDG. 1 & 2 & SITE
G-202	FIRE LIFE SAFETY PLAN - BUILDING 1
G-203	FIRE LIFE SAFETY PLAN - BUILDING 2
G-204	MINIMUM PLUMBING FIXTURE CALCULATIONS

SURVEY

SV-101	OVERALL TOPOGRAPHIC SURVEY
SV-102	ENLARGED TOPOGRAPHIC SURVEY

CIVIL

C-101	DEMOLITION PLAN
C-102	UTILITY DEMOLITION PLAN
C-103	TREE PROTECTION PLAN
C-104	PAVING PLAN
C-105	GRADING PLAN
C-106	UTILITY PLAN
C-107	EROSION CONTROL PLAN
C-108	AERIAL LIFT OPERATIONS PLAN
C-301	CIVIL DETAILS

LANDSCAPE

L-101	IRRIGATION DEMOLITION PLAN
L-102	IRRIGATION PLAN
L-103	IRRIGATION CALCULATIONS
L-201	TREE PLAN
L-202	SHRUB & GROUNDCOVER PLAN I
L-203	SHRUB & GROUNDCOVER PLAN II
L-301	LANDSCAPE DETAILS I
L-302	LANDSCAPE DETAILS II
L-303	LANSCAPE DETAILS III

STRUCTURAL

S-001	GENERAL NOTES
S-002	GENERAL NOTES
S-003	ABBRV, SYMBOLS, & DRAWING LIST
S-004	LOADING DIAGRAMS - BUILDING 1
S-005	LOADING DIAGRAM - BUILDING 2
S1-101	FOUNDATION AND FIRST FLOOR PLAN - BUILDING 1
S1-102	SECOND FLOOR PLAN - BUILDING 1
S1-103	THIRD FLOOR PLAN - BUILDING 1
S1-104	FOURTH FLOOR PLAN - BUILDING 1
S1-105	FIFTH FLOOR PLAN - BUILDING 1
S1-142	ROOF PLAN - BUILDING 1
S2-10B	BASEMENT FLOOR PLAN - BUILDING 2
S2-101	FIRST FLOOR PLAN - BUILDING 2
S2-102	SECOND FLOOR PLAN - BUILDING 2
S2-103	THIRD FLOOR PLAN - BUILDING 2
S2-104	FOURTH FLOOR PLAN - BUILDING 2
S2-105	FIFTH FLOOR PLAN - BUILDING 2
S2-142	ROOF PLAN - BUILDING 2
S-301	PARTIAL PLANS
S-501	FOUNDATION DETAILS & SECTIONS
S-502	FOUNDATION DETAILS & SECTIONS
S-511	POST TENSION DETAILS
S-521	MASONRY DETAILS & SECTIONS
S-531	STEEL FRAME DETAILS & SECTIONS
S-532	STEEL FRAME DETAILS & SECTIONS
S-533	STEEL FRAME DETAILS & SECTIONS
S-541	METAL STUD FRAMING DETAILS
S-551	FRP REINFORCEMENT
S-552	FRP PARTIAL PLANS
S-553	FRAMING PARTIAL PLANS
S-554	FRP PARTIAL PLANS
S-555	FRP PARTIAL PLANS
S-561	EQUIPMENT ANCHORAGE & DETAILS
S-571	SECONDARY STEEL DETAILS & SECTIONS

ARCHITECTURAL SITE

AS-101	OVERALL SITE PLAN - EXISTING
AS-102	ENLARGED SITE PLAN - DEMOLITION
AS-103	ENLARGED SITE PLAN - NEW
AS-201	SITE DETAILS - FIRE PUMP HOUSE
AS-202	SITE DETAILS - MECHANICAL ENCLOSURES
AS-203	SITE DETAILS - FENCING & MISC.
AS-204	SITE DETAILS - SIGNAGE

ARCHITECTURAL DEMO

AD1-101	DEMOLITION FIRST FLOOR PLAN - BUILDING 1
AD1-102	DEMOLITION SECOND FLOOR PLAN - BUILDING 1
AD1-103	DEMOLITION THIRD FLOOR PLAN - BUILDING 1
AD1-104	DEMOLITION FOURTH FLOOR PLAN - BUILDING 1
AD1-105	DEMOLITION FIFTH FLOOR PLAN - BUILDING 1
AD1-111	DEMOLITION FIRST FLOOR REFLECTED CEILING PLAN - BUILDING 1
AD1-112	DEMOLITION SECOND FLOOR REFLECTED CEILING PLAN - BUILDING 1
AD1-113	DEMOLITION THIRD FLOOR REFLECTED CEILING PLAN - BUILDING 1
AD1-114	DEMOLITION FOURTH FLOOR REFLECTED CEILING PLAN - BUILDING 1
AD1-115	DEMOLITION FIFTH FLOOR REFLECTED CEILING PLAN - BUILDING 1
AD1-141	DEMOLITION ROOF PLAN - BUILDING 1
AD2-10B	DEMOLITION BASEMENT FLOOR PLAN - BUILDING 2
AD2-101	DEMOLITION FIRST FLOOR PLAN - BUILDING 2
AD2-102	DEMOLITION SECOND FLOOR PLAN - BUILDING 2
AD2-103	DEMOLITION THIRD FLOOR PLAN - BUILDING 2
AD2-104	DEMOLITION FOURTH FLOOR PLAN - BUILDING 2
AD2-105	DEMOLITION FIFTH FLOOR PLAN - BUILDING 2
AD2-11B	DEMOLITION BASEMENT FLOOR REFLECTED CEILING PLAN - BUILDING 2
AD2-111	DEMOLITION FIRST FLOOR REFLECTED CEILING PLAN - BUILDING 2
AD2-112	DEMOLITION SECOND FLOOR REFLECTED CEILING PLAN - BUILDING 2
AD2-113	DEMOLITION THIRD FLOOR REFLECTED CEILING PLAN - BUILDING 2
AD2-114	DEMOLITION FOURTH FLOOR REFLECTED CEILING PLAN - BUILDING 2
AD2-115	DEMOLITION FIFTH FLOOR REFLECTED CEILING PLAN - BUILDING 2
AD2-141	DEMOLITION ROOF PLAN - BUILDING 2

ARCHITECTURAL

A-001	SCHEDULES & NOTES
A1-101	FIRST FLOOR PLAN - BUILDING 1
A1-102	SECOND FLOOR PLAN - BUILDING 1
A1-103	THIRD FLOOR PLAN - BUILDING 1
A1-104	FOURTH FLOOR PLAN - BUILDING 1
A1-105	FIFTH FLOOR PLAN - BUILDING 1
A1-111	FIRST FLOOR REFLECTED CEILING PLAN - BUILDING 1
A1-112	SECOND FLOOR REFLECTED CEILING PLAN - BUILDING 1
A1-113	THIRD FLOOR REFLECTED CEILING PLAN - BUILDING 1
A1-114	FOURTH FLOOR REFLECTED CEILING PLAN - BUILDING 1
A1-115	FIFTH FLOOR REFLECTED CEILING PLAN - BUILDING 1
A1-141	ROOF PLAN- BUILDING 1
A1-151	FIRST FLOOR SIGNAGE & DIMENSION PLAN - BUILDING 1
A1-152	SECOND FLOOR SIGNAGE & DIMENSION PLAN - BUILDING 1
A1-153	THIRD FLOOR SIGNAGE & DIMENSION PLAN - BUILDING 1
A1-154	FOURTH FLOOR SIGNAGE & DIMENSION PLAN - BUILDING 1
A1-155	FIFTH FLOOR SIGNAGE & DIMENSION PLAN - BUILDING 1
A2-10B	BASEMENT FLOOR PLAN - BUILDING 2
A2-101	FIRST FLOOR PLAN - BUILDING 2

A2-102	SECOND FLOOR PLAN - BUILDING 2
A2-103	THIRD FLOOR PLAN - BUILDING 2
A2-104	FOURTH FLOOR PLAN - BUILDING 2
A2-105	FIFTH FLOOR PLAN - BUILDING 2
A2-11B	BASEMENT FLOOR REFLECTED CEILING PLAN - BUILDING 2
A2-111	FIRST FLOOR REFLECTED CEILING PLAN - BUILDING 2
A2-112	SECOND FLOOR REFLECTED CEILING PLAN - BUILDING 2
A2-113	THIRD FLOOR REFLECTED CEILING PLAN - BUILDING 2
A2-114	FOURTH FLOOR REFLECTED CEILING PLAN - BUILDING 2
A2-115	FIFTH FLOOR REFLECTED CEILING PLAN - BUILDING 2
A2-141	ROOF PLAN- BUILDING 2
A2-15B	BASEMENT SIGNAGE & DIMENSION PLAN - BUILDING 2
A2-151	FIRST FLOOR SIGNAGE & DIMENSION PLAN - BUILDING 2
A2-152	SECOND FLOOR SIGNAGE & DIMENSION PLAN - BUILDING 2
A2-153	THIRD FLOOR SIGNAGE & DIMENSION PLAN - BUILDING 2
A2-154	FOURTH FLOOR SIGNAGE & DIMENSION PLAN - BUILDING 2
A2-155	FIFTH FLOOR SIGNAGE & DIMENSION PLAN - BUILDING 2
A1-201	EXTERIOR ELEVATIONS
A1-202	EXTERIOR ELEVATIONS
A2-201	EXTERIOR ELEVATIONS
A2-202	EXTERIOR ELEVATIONS
A1-301	BUILDING SECTION - BUILDING 1
A1-302	BUILDING SECTION - BUILDING 1
A2-301	BUILDING SECTION - BUILDING 2
A2-302	BUILDING SECTION - BUILDING 2
A1-351	WALL SECTIONS - BUILDING 1
A2-351	WALL SECTIONS - BUILDING 2
A1-401	ENLARGED PLAN - COUNCIL CHAMBERS - BLDG 1
A1-401.1	ENLARGED SLAB PLAN - COUNCIL CHAMBERS - BLDG 1
A1-402	ENLARGED PLANS & INT. ELEV. - FIRST FLOOR RESTROOMS - BLDG 1
A1-403	ENLARGED PLANS & INT. ELEV. - SECOND & FIFTH FLOOR RESTROOMS - BLDG 1
A1-421	INTERIOR ELEVATIONS - BUILDING 1
A1-423	INTERIOR ELEVATIONS - FIFTH FLOOR - BLDG 1
A2-401	ENLARGED PLANS & INT ELEV - FIRST FLOOR RESTROOMS - BLDG 2
A2-402	ENLARGED PLANS & INT ELEV- SECOND & FOURTH FLOOR RESTROOMS - BLDG 2
A-501	STANDARD PARTITION WALL DETAILS
A-502	STANDARD PARTITION WALL DETAILS
A-503	STANDARD PARTITION WALL DETAILS
A-504	STANDARD PARTITION WALL DETAILS
A-505	STANDARD PARTITION WALL DETAILS
A-506	STANDARD PARTITION WALL DETAILS
A-507	STANDARD PARTITION WALL DETAILS
A-508	STANDARD PARTITION WALL DETAILS
A-509	STANDARD PARTITION WALL DETAILS
A-510	STANDARD GYP.BD.CEILING DETAILS
A-511	STANDARD GYP.BD.CEILING DETAILS
A-512	STANDARD GYP.BD.CEILING DETAILS
A-513	STANDARD GYP.BD.CEILING DETAILS
A-514	STANDARD GYP.BD.CEILING DETAILS

A-515	STANDARD GYP.BD.CEILING DETAILS
A-516	STANDARD GYP.BD.CEILING DETAILS
A-517	STANDARD GYP.BD.CEILING DETAILS
A-518	STANDARD SUSPENDED TILE CEILING DETAILS
A-519	STANDARD SUSPENDED TILE CEILING DETAILS
A-520	STANDARD SUSPENDED TILE CEILING DETAILS
A-521	STANDARD SUSPENDED TILE CEILING DETAILS
A-522	STANDARD SUSPENDED TILE CEILING DETAILS
A-523	STANDARD SUSPENDED TILE CEILING DETAILS
A-524	STANDARD SUSPENDED TILE CEILING DETAILS
A-525	EXTERIOR DETAILS
A-526	ROOF DETAILS
A-531	INTERIOR DETAILS
A-532	INTERIOR DETAILS
A-533	INTERIOR DETAILS
A-541	CEILING DETAILS
A-542	CEILING DETAILS
A-551	DOOR AND WINDOW DETAILS
A-552	DOOR AND WINDOW DETAILS
A-553	WINDOW & LOUVER DETAILS
A-561	CASEWORK ENLARGED PLANS & DETAILS - DAIS
A-562	CASEWORK ENLARGED PLANS & DETAILS - SPEAKER PODIUM
A-563	CASEWORK ENLARGED PLANS - PUBLIC COUNTERS
A-564	CASEWORK DETAILS - REVENUE PUBLIC COUNTER
A-565	CASEWORK DETAILS - BUILDING / PLANNING / FIRE PUBLIC COUNTERS
A-566	CASEWORK DETAILS
A-567	CASEWORK DETAILS
A-571	SIGNAGE DETAILS
A-572	SIGNAGE DETAILS
A-573	SPECIALTY SIGNAGE DETAILS
A-574	EXTERIOR SIGNAGE DETAILS
A-581	WALL TYPE DETAILS
A-582	WALL TYPE DETAILS - TOP CONDITIONS
A-583	WALL TYPE DETAILS - BOTTOM CONDITIONS
A-591	EIFS REPAIR DETAILS
A-601	DOOR SCHEDULE - BUILDING 1
A-602	DOOR SCHEDULE - BUILDING 2
A-603	DOOR & FRAME TYPE SCHEDULE - LEGENDS & NOTES
A-604	WINDOW & LOUVER SCHEDULES - BUILDINGS 1 & 2

INTERIOR

I1-101	FIRST FLOOR FINISH PLAN - BUILDING 1
I1-102	SECOND FLOOR FINISH PLAN - BUILDING 1
I1-103	THIRD FLOOR FINISH PLAN - BUILDING 1
I1-104	FOURTH FLOOR FINISH PLAN - BUILDING 1
I1-105	FIFTH FLOOR FINISH PLAN - BUILDING 1
I2-10B	BASEMENT FINISH PLAN - BUILDING 2
I2-101	FIRST FLOOR FINISH PLAN - BUILDING 2

I2-102	SECOND FLOOR FINISH PLAN - BUILDING 2
I2-103	THIRD FLOOR FINISH PLAN - BUILDING 2
I2-104	FOURTH FLOOR FINISH PLAN - BUILDING 2
I2-105	FIFTH FLOOR FINISH PLAN - BUILDING 2
IE1-101	INTERIOR ELEVATIONS - BUILDING 1 FIRST - SECOND FLOORS
IE1-102	INTERIOR ELEVATIONS - BUILDING 1 THIRD - FIFTH FLOORS
IE2-101	INTERIOR ELEVATIONS - BUILDING 2 PUBLIC COUNTERS
IE2-102	INTERIOR ELEVATIONS - BUILDING 2 FIRST - SECOND FLOORS
IE2-103	INTERIOR ELEVATIONS - BUILDING 2 SECOND - FIFTH FLOORS
IE2-104	INTERIOR ELEVATIONS - BUILDING 2 BASEMENTS
IF1-101	FIRST FLOOR FURNITURE PLAN - BUILDING 1
IF1-102	SECOND FLOOR FURNITURE PLAN - BUILDING 1
IF1-103	THIRD FLOOR FURNITURE PLAN - BUILDING 1
IF1-104	FOURTH FLOOR FURNITURE PLAN - BUILDING 1
IF1-105	FIFTH FLOOR FURNITURE PLAN - BUILDING 1
IF2-10B	BASEMENT FURNITURE PLAN - BUILDING 2
IF2-101	FIRST FLOOR FURNITURE PLAN - BUILDING 2
IF2-102	SECOND FLOOR FURNITURE PLAN - BUILDING 2
IF2-103	THIRD FLOOR FURNITURE PLAN - BUILDING 2
IF2-104	FOURTH FLOOR FURNITURE PLAN - BUILDING 2
IF2-105	FIFTH FLOOR FURNITURE PLAN - BUILDING 2

VOLUME 2

GENERAL

G-001	COVER SHEET (VOLUME 2)
G-002	PROJECT INFO (VOLUME 2)

MECHANICAL

M-001	SYMBOLS & NOTES
M-002	SCHEDULES
M-003	SCHEDULES
M-004	SCHEDULES
M-005	SCHEDULES
M-006	SCHEDULES
M-007	REFRIGERANT CHARGE CALCULATIONS (ASHRAE 15)
MD1-101	DEMOLITION FIRST FLOOR PLAN - BUILDING 1
MD1-102	DEMOLITION SECOND FLOOR PLAN - BUILDING 1
MD1-103	DEMOLITION THIRD FLOOR PLAN - BUILDING 1
MD1-104	DEMOLITION FOURTH FLOOR PLAN - BUILDING 1
MD1-105	DEMOLITION FIFTH FLOOR PLAN - BUILDING 1
MD1-141	DEMOLITION ROOF PLAN - BUILDING 1
MD2-101	DEMOLITION FIRST FLOOR PLAN - BUILDING 2
MD2-102	DEMOLITION SECOND FLOOR PLAN - BUILDING 2
MD2-103	DEMOLITION THIRD FLOOR PLAN - BUILDING 2
MD2-104	DEMOLITION FOURTH FLOOR PLAN - BUILDING 2
MD2-105	DEMOLITION FIFTH FLOOR PLAN - BUILDING 2

MD2-141	DEMOLITION ROOF PLAN - BUILDING 2
M1-101	MECHANICAL FIRST FLOOR PLAN - BUILDING 1
M1-102	MECHANICAL SECOND FLOOR PLAN - BUILDING 1
M1-103	MECHANICAL THIRD FLOOR PLAN - BUILDING 1
M1-104	MECHANICAL FOURTH FLOOR PLAN - BUILDING 1
M1-105	MECHANICAL FIFTH FLOOR PLAN - BUILDING 1
M1-141	MECHANICAL ROOF PLAN - BUILDING 1
M1-201	MECHANICAL FIRST FLOOR PIPING PLAN - BUILDING 1
M2-10B	MECHANICAL BASEMENT FLOOR PLAN - BUILDING 2
M2-101	MECHANICAL FIRST FLOOR PLAN - BUILDING 2
M2-102	MECHANICAL SECOND FLOOR PLAN - BUILDING 2
M2-103	MECHANICAL THIRD FLOOR PLAN - BUILDING 2
M2-104	MECHANICAL FOURTH FLOOR PLAN - BUILDING 2
M2-105	MECHANICAL FIFTH FLOOR PLAN - BUILDING 2
M2-141	MECHANICAL ROOF PLAN - BUILDING 2
M2-201	MECHANICAL FIRST FLOOR PIPING PLAN - BUILDING 2
M-301	REFRIGERANT PIPING DIAGRAMS - BUILDING 1
M-302	REFRIGERANT PIPING DIAGRAMS - BUILDING 2
M-311	AIRFLOW RISER DIAGRAMS - BUILDING 1
M-312	AIRFLOW RISER DIAGRAMS - BUILDING 2
M-401	DETAILS
M-402	DETAILS
M-403	DETAILS
M-404	DETAILS
M-405	DETAILS
M-411	CURB DRAWINGS
M-412	CURB DRAWINGS
M-413	CURB DRAWINGS
M-501	CONTROLS DETAILS
M-502	CONTROLS DETAILS
M-503	CONTROLS DETAILS
M-511	VRF WIRING DIAGRAMS - BUILDING 1
M-512	VRF WIRING DIAGRAMS - BUILDING 2
M-601	MECH & ENV T24
M-602	MECH & ENV T24
M-603	MECH & ENV T24
M-604	MECH & ENV T24
M-605	MECH & ENV T24
M-606	MECH & ENV T24

PLUMBING

P-001	SYMBOLS & NOTES
P-002	SCHEDULES
PD1-101	DEMOLITION FIRST FLOOR PLAN - BUILDING 1
PD1-102	DEMOLITION SECOND FLOOR PLAN - BUILDING 1
PD1-103	DEMOLITION THIRD FLOOR PLAN - BUILDING 1
PD1-104	DEMOLITION FOURTH FLOOR PLAN - BUILDING 1
PD1-105	DEMOLITION FIFTH FLOOR PLAN - BUILDING 1

PD1-141	DEMOLITION ROOF PLAN - BUILDING 1
PD2-10B	DEMOLITION BASEMENT FLOOR PLAN - BUILDING 2
PD2-101	DEMOLITION FIRST FLOOR PLAN - BUILDING 2
PD2-102	DEMOLITION SECOND FLOOR PLAN - BUILDING 2
PD2-103	DEMOLITION THIRD FLOOR PLAN - BUILDING 2
PD2-104	DEMOLITION FOURTH FLOOR PLAN - BUILDING 2
PD2-105	DEMOLITION FIFTH FLOOR PLAN - BUILDING 2
PD2-141	DEMOLITION ROOF PLAN - BUILDING 2
P1-101	PLUMBING FIRST FLOOR PLAN - BUILDING 1
P1-102	PLUMBING SECOND FLOOR PLAN - BUILDING 1
P1-103	PLUMBING THIRD FLOOR PLAN - BUILDING 1
P1-104	PLUMBING FOURTH FLOOR PLAN - BUILDING 1
P1-105	PLUMBING FIFTH FLOOR PLAN - BUILDING 1
P1-141	PLUMBING ROOF PLAN - BUILDING 1
P2-10B	PLUMBING BASEMENT FLOOR PLAN - BUILDING 2
P2-101	PLUMBING FIRST FLOOR PLAN - BUILDING 2
P2-102	PLUMBING SECOND FLOOR PLAN - BUILDING 2
P2-103	PLUMBING THIRD FLOOR PLAN - BUILDING 2
P2-104	PLUMBING FOURTH FLOOR PLAN - BUILDING 2
P2-105	PLUMBING FIFTH FLOOR PLAN - BUILDING 2
P2-141	PLUMBING ROOF PLAN - BUILDING 2
P-401	PLUMBING DETAILS
P-402	PLUMBING DETAILS
P-403	PLUMBING DETAILS

FIRE PROTECTION

FP-101	FIRE PROTECTION SITE PLAN
FP1-101	FIRE PROTECTION FIRST FLOOR PLAN - BUILDING 1
FP1-102	FIRE PROTECTION SECOND TO FIFTH FLOOR PLAN - BUILDING 1
FP1-103	FIRE PROTECTION THIRD FLOOR PLAN - BUILDING 1
FP2-10B	FIRE PROTECTION BASEMENT FLOOR PLAN - BUILDING 2
FP2-101	FIRE PROTECTION FIRST FLOOR PLAN - BUILDING 2
FP2-102	FIRE PROTECTION SECOND TO FIFTH FLOOR PLAN - BUILDING 2
FP-201	ELEVATIONS AND DETAILS

ELECTRICAL

E-001	ELECTRICAL SYMBOL LIST & ABBREVIATIONS
E-002	ELECTRICAL DEMOLITION & GENERAL NOTES
E-003	LUMINAIRE SCHEDULE AND VOLTAGE DROP TABLE
ES-101	OVERALL SITE PLAN DEMOLITION - ELECTRICAL
ES-102	OVERALL SITE PLAN REMODEL - ELECTRICAL
ED1-101	FIRST FLOOR DEMOLITION PLAN - LIGHTING - BUILDING 1
ED1-102	SECOND FLOOR DEMOLITION PLAN - LIGHTING - BUILDING 1
ED1-103	THIRD FLOOR DEMOLITION PLAN - LIGHTING - BUILDING 1
ED1-104	FOURTH FLOOR DEMOLITION PLAN - LIGHTING - BUILDING 1
ED1-105	FIFTH FLOOR DEMOLITION PLAN - LIGHTING - BUILDING 1
ED1-201	FIRST FLOOR DEMOLITION PLAN - ELECTRICAL - BUILDING 1

ED1-202	SECOND FLOOR DEMOLITION PLAN - ELECTRICAL - BUILDING 1
ED1-203	THIRD FLOOR DEMOLITION PLAN - ELECTRICAL - BUILDING 1
ED1-204	FOURTH FLOOR DEMOLITION PLAN - ELECTRICAL - BUILDING 1
ED1-205	FIFTH FLOOR DEMOLITION PLAN - ELECTRICAL - BUILDING 1
ED1-206	ROOF DEMOLITION PLAN - ELECTRICAL - BUILDING 1
ED2-100	BASEMENT DEMOLITION PLAN - LIGHTING - BUILDING 2
ED2-101	FIRST FLOOR DEMOLITION PLAN - LIGHTING - BUILDING 2
ED2-102	SECOND FLOOR DEMOLITION PLAN - LIGHTING - BUILDING 2
ED2-103	THIRD FLOOR DEMOLITION PLAN - LIGHTING - BUILDING 2
ED2-104	FOURTH FLOOR DEMOLITION PLAN - LIGHTING - BUILDING 2
ED2-105	FIFTH FLOOR DEMOLITION PLAN - LIGHTING - BUILDING 2
ED2-200	BASEMENT DEMOLITION PLAN - ELECTRICAL - BUILDING 2
ED2-201	FIRST FLOOR DEMOLITION PLAN - ELECTRICAL - BUILDING 2
ED2-202	SECOND FLOOR DEMOLITION PLAN - ELECTRICAL - BUILDING 2
ED2-203	THIRD FLOOR DEMOLITION PLAN - ELECTRICAL - BUILDING 2
ED2-204	FOURTH FLOOR DEMOLITION PLAN - ELECTRICAL - BUILDING 2
ED2-205	FIFTH FLOOR DEMOLITION PLAN - ELECTRICAL - BUILDING 2
ED2-206	ROOF DEMOLITION PLAN - ELECTRICAL - BUILDING 2
E1-101	FIRST FLOOR REMODEL PLAN - LIGHTING - BUILDING 1
E1-102	SECOND FLOOR REMODEL PLAN - LIGHTING - BUILDING 1
E1-103	THIRD FLOOR REMODEL PLAN - LIGHTING - BUILDING 1
E1-104	FOURTH FLOOR REMODEL PLAN - LIGHTING - BUILDING 1
E1-105	FIFTH FLOOR REMODEL PLAN - LIGHTING - BUILDING 1
E1-111	ENLARGED FIRST FLOOR COUNCIL ROOM - LIGHTING - BUILDING 1
E1-301	FIRST FLOOR REMODEL PLAN - ELECTRICAL - BUILDING 1
E1-301.1	FIRST FLOOR REMODEL PLAN - MECHANICAL - BUILDING 1
E1-302	SECOND FLOOR REMODEL PLAN - ELECTRICAL - BUILDING 1
E1-303	THIRD FLOOR REMODEL PLAN - ELECTRICAL - BUILDING 1
E1-304	FOURTH FLOOR REMODEL PLAN - ELECTRICAL - BUILDING 1
E1-305	FIFTH FLOOR REMODEL PLAN - ELECTRICAL - BUILDING 1
E1-306	ROOF REMODEL PLAN - ELECTRICAL - BUILDING 1
E1-311	ENLARGED 1ST & 2ND FLOOR PLANS - ELECTRICAL - BUILDING 1
E1-312	ENLARGED 3RD FLOOR PLAN - ELECTRICAL - BUILDING 1
E1-313	ENLARGED 4TH, 5TH FLOOR PLANS - ELECTRICAL - BUILDING 1
E1-314	ENLARGED FIRST FLOOR COUNCIL ROOM - ELECTRICAL - BUILDING 1
E2-100	BASEMENT REMODEL PLAN - LIGHTING - BUILDING 2
E2-101	FIRST FLOOR REMODEL PLAN - LIGHTING - BUILDING 2
E2-102	SECOND FLOOR REMODEL PLAN - LIGHTING - BUILDING 2
E2-103	THIRD FLOOR REMODEL PLAN - LIGHTING - BUILDING 2
E2-104	FOURTH FLOOR REMODEL PLAN - LIGHTING - BUILDING 2
E2-105	FIFTH FLOOR REMODEL PLAN - LIGHTING - BUILDING 2
E2-300	BASEMENT FLOOR REMODEL PLAN - ELECTRICAL - BUILDING 2
E2-301	FIRST FLOOR REMODEL PLAN - ELECTRICAL - BUILDING 2
E2-301.1	FIRST FLOOR REMODEL PLAN - MECHANICAL - BUILDING 2
E2-302	SECOND FLOOR REMODEL PLAN - ELECTRICAL - BUILDING 2
E2-303	THIRD FLOOR REMODEL PLAN - ELECTRICAL - BUILDING 2
E2-304	FOURTH FLOOR REMODEL PLAN - ELECTRICAL - BUILDING 2
E2-305	FIFTH FLOOR REMODEL PLAN - ELECTRICAL - BUILDING 2
E2-306	ROOF REMODEL PLAN - ELECTRICAL - BUILDING 2

E2-310	ENLARGED BASEMENT & 2ND FLOOR PLANS - ELECTRICAL - BUILDING 2
E2-311	ENLARGED 3RD FLOOR PLANS - ELECTRICAL - BUILDING 2
E2-312	ENLARGED 4TH, 5TH FLOOR PLAN - ELECTRICAL - BUILDING 2
ES-501	ONE-LINE POWER DIAGRAM - SITE
E1-501	ONE-LINE POWER DIAGRAM - BUILDING 1
E2-501	ONE-LINE POWER DIAGRAM - BUILDING 2
EET-501	RISER DIAGRAM - DATA
EET-502	RISER DIAGRAM - GROUNDING
EET-503	RISER DIAGRAM - GROUNDING
EET-504	AT&T COMMERCIAL DEVELOPMENT REQUIREMENTS
ES-601	PANEL SCHEDULE & VOLTAGE DROP CALCS - SITE
E1-601	FIRST FLOOR PANEL SCHEDULE & VOLTAGE DROP CALCULATIONS - BLDG 1
E1-602	SECOND FLOOR PANEL SCHEDULE & VOLTAGE DROP CALCULATIONS - BLDG 1
E1-603	THIRD FLOOR PANEL SCHEDULE & VOLTAGE DROP CALCULATIONS - BLDG 1
E1-604	FOURTH FLOOR PANEL SCHEDULE & VOLTAGE DROP CALCULATIONS - BLDG 1
E1-605	FIFTH FLOOR PANEL SCHDULE & VOLTAGE DROP CALCULATIONS - BLDG 1
E1-606	ROOF PANEL SCHEDULES & VOLTAGE DROP CALCULATIONS - BLDG 1
E2-600	BASEMENT FLOOR PANEL SCHEDULE & VOLTAGE DROP CALCULATIONS - BLDG 2
E2-601	FIRST FLOOR PANEL SCHEDULE & VOLTAGE DROP CALCULATIONS - BLDG 2
E2-602	SECOND FLOOR PANEL SCHEDULE & VOLTAGE DROP CALCULATIONS - BLDG 2
E2-603	THIRD FLOOR PANEL SCHEDULE & VOLTAGE DROP CALCULATIONS - BLDG 2
E2-604	FOURTH FLOOR PANEL SCHEDULE & VOLTAGE DROP CALCULATIONS - BLDG 2
E2-605	FIFTH FLOOR PANEL SCHEDULE & VOLTAGE DROP CALCULATIONS - BLDG 2
E2-606	ROOF PANEL SCHEDULE & VOLTAGE DROP CALCULATIONS - BLDG 2
E-701	ELECTRICAL DETAILS - FLOOR PENETRATIONS
E-702	ELECTRICAL DETAILS - WALL PENETRATIONS
E-703	ELECTRICAL DETAILS - EQUIPMENT ELEVATION & MOUNTING
E-704	ELECTRICAL DETAILS - EQUIPMENT ELEVATION & MOUNTING
E-705	ELECTRICAL DETAILS - SITE WORK
E-706	ELECTRICAL DETAILS - SITE WORK
E-707	ELECTRICAL DETAILS - LIGHTING
E-708	ELECTRICAL DETAILS - CONDUIT MOUNTING & DEVICES
E-709	ELECTRICAL DETAILS - CONDUIT MOUNTING & DEVICES
E-710	ELECTRICAL DETAILS - CONDUIT MOUNTING & DEVICES
E-711	ELECTRICAL DETAILS - CONDUIT MOUNTING & DEVICES
E-712	ELECTRICAL DETAILS - CONDUIT MOUNTING & DEVICES
E-713	ELECTRICAL DETAILS – ELECTRICAL DETAILS – FIRE SUPPRESSION
E-801	TITLE 24 - INDOOR LIGHTING COMPLIANCE FORMS – BUILDING 1
E-802	TITLE 24 - INDOOR LIGHTING COMPLIANCE FORMS – BUILDING 1
E-803	TITLE 24 - OUTDOOR LIGHTING COMPLIANCE FORMS – BUILDING 2
E-804	TITLE 24 - OUTDOOR LIGHTING COMPLIANCE FORMS – BUILDING 2
E-805	TITLE 24 - ELECTRICAL POWER DISTRIBUTION
E-806	TITLE 24 - ELECTRICAL POWER DISTRIBUTION

SECURITY

T0-001	SECURITY ELECTRONICS LEGEND AND NOTES SHEET
T1-100.1	SECURITY ELECTRONICS ENLARGED SITE PLAN WEST
T1-100.2	SECURITY ELECTRONICS ENLARGED SITE PLAN EAST

T1-101	SECURITY ELECTRONICS FIRST FLOOR PLAN - BUILDING 1
T1-102	SECURITY ELECTRONICS SECOND FLOOR PLAN - BUILDING 1
T1-103	SECURITY ELECTRONICS THIRD FLOOR PLAN - BUILDING 1
T1-104	SECURITY ELECTRONICS FOURTH FLOOR - BUILDING 1
T1-105	SECURITY ELECTRONICS FIFTH FLOOR - BUILDING 1
T2-10B	SECURITY ELECTRONICS BASEMENT FLOOR PLAN - BUILDING 2
T2-101	SECURITY ELECTRONICS FIRST FLOOR PLAN - BUILDING 2
T2-102	SECURITY ELECTRONICS SECOND FLOOR PLAN - BUILDING 2
T2-103	SECURITY ELECTRONICS THIRD FLOOR PLAN - BUILDING 2
T2-104	SECURITY ELECTRONICS FOURTH FLOOR PLAN - BUILDING 2
T2-105	SECURITY ELECTRONICS FIFTH FLOOR PLAN - BUILDING 2
T3-01	SECURITY ELECTRONICS RISER DIAGRAM - BUILDING 1
T3-02	SECURITY ELECTRONICS RISER DIAGRAM - BUILDING 2
T4-01	SECURITY ELECTRONICS DETAILS SHEET
T4-02	SECURITY ELECTRONICS DETAILS SHEET
T4-03	SECURITY ELECTRONICS DETAILS SHEET
T4-04	SECURITY ELECTRONICS DETAILS SHEET
T4-05	SECURITY ELECTRONICS DETAILS SHEET

AUDIO VISUAL

AV0-001	AUDIO VISUAL LEGEND AND NOTES SHEET
AV1-101	AUDIO VISUAL FIRST FLOOR PLAN - BUILDING 1
AV1-101.1	AUDIO VISUAL FIRST FLR PLAN - BUILDING 1 ENLARGED PLAN
AV1-102	AUDIO VISUAL SECOND FLOOR PLAN - BUILDING 1
AV1-103	AUDIO VISUAL THIRD FLOOR PLAN - BUILDING 1
AV1-104	AUDIO VISUAL FOURTH FLOOR PLAN - BUILDING 1
AV1-105	AUDIO VISUAL FIFTH FLOOR PLAN - BUILDING 1
AV2-10B	AUDIO VISUAL BASEMENT FLOOR PLAN - BUILDING 2
AV2-101	AUDIO VISUAL FIRST FLOOR PLAN - BUILDING 2
AV2-102	AUDIO VISUAL SECOND FLOOR PLAN - BUILDING 2
AV2-103	AUDIO VISUAL THIRD FLOOR PLAN - BUILDING 2
AV2-104	AUDIO VISUAL FOURTH FLOOR PLAN - BUILDING 2
AV2-105	AUDIO VISUAL FIFTH FLOOR PLAN - BUILDING 2
AV-301	AUDIO VISUAL SINGLE LINES
AV-302	AUDIO VISUAL SINGLE LINES
AV-303	AUDIO VISUAL SINGLE LINES
AV-304	AUDIO VISUAL SINGLE LINES
AV-305	AUDIO VISUAL SINGLE LINES
AV-306	AUDIO VISUAL SINGLE LINES
AV-307	AUDIO VISUAL SINGLE LINES
AV-308	AUDIO VISUAL SIGNLE LINES
AV-401	AUDIO VISUAL DETAILS SHEET
AV-402	AUDIO VISUAL DETAILS SHEET
AV-403	AUDIO VISUAL DETAILS SHEET

END OF SECTION

This page intentionally left blank

SECTION 00 72 13
SPECIAL PROVISIONS

ARTICLE 0.1 – GENERAL

1.0 The Articles herein delete, change, or add to the City of Stockton Standard Specifications as specifically related to this Project. If not specifically identified as "Delete" or "Change", the Articles herein are additions to the Standard Specifications.
1.0.1 Delete the following Sections and/or Articles of the City of Stockton Standard Specifications:
1.0.1.1 Delete Article 5-1.02 Contract Components. Refer instead to Special Provisions Article 1 herein.
1.0.1.2 Delete Article 5-1.26 Construction Surveys.
1.0.1.3 Delete Section 19 through Section 100. Refer instead to the technical specification sections.

ARTICLE 1 - GENERAL TERMS AND DOCUMENTS (REPLACES SECTION 5-1.02)

ARTICLE 2 - THE OWNER (ADDED SECTION)

ARTICLE 1 - GENERAL TERMS AND DOCUMENTS

1.1 LANGUAGE

1.1.1 USAGE. The following applies to the language used in these Contract Documents:

1.1.1.1 Absence of Modifiers. In the interest of brevity, the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

1.1.1.2 Any. “Any” is used in its inclusive sense, meaning “any and all” or “any and every”.

1.1.1.3 Article, Paragraph. Use of Article, Sub-article, Paragraph, and Subparagraph numbers are references to the respective portion of these Special Provisions unless otherwise stated.

1.1.1.4 As Shown, Etc. Where "as shown," "as indicated," "as detailed," or words of similar meaning are used, reference is made to the Drawings unless otherwise stated. Where "as directed," "as required," "as permitted," "as authorized," "as accepted," "as selected," or words of similar meaning are used, the direction, requirement, permission, authorization, approval, acceptance, or selection by Architect is intended unless otherwise stated.

1.1.1.5 Capitalization. Terms specifically defined in these Special Provisions are capitalized. Where these words are used without capitalization their meaning shall be the commonly accepted meaning for the context in which they are used.

1.1.1.6 Existing, (E), (e): Existing construction item or element, to remain or to be removed as may be indicated. Where no new or existing modifier word is used, Contractor will assume the item or element is included in the scope of work as new construction to be to be procured, provided, and installed by Contractor. Mutually exclusive with “New”, see below.

1.1.1.7 Imperative Mood. Specifications and annotations on drawings are written in Imperative Mood and are to be interpreted as instructions to the Contractor. In the interest of brevity incomplete sentences are used. Omission of words or phrases such as "Contractor shall," "shall be," or words of similar meaning are used, are intentional. Omitted words or shall be supplied by inference.

1.1.1.8 Include. “Including” means “including but not limited to”. “Include” is defined in the same non-limiting way.

1.1.1.9 New, (N), (n): New construction item or element, to be procured, provided, and installed by Contractor. Where no new or existing modifier word is indicated, Contractor will include in the scope of work as new construction to be to be procured, provided, and installed by Contractor. Mutually exclusive with “Existing”, see above.

1.1.1.10 Plural. Words in the singular shall include the plural whenever applicable or the context so indicates.

1.1.1.11 Provide. "Provide" means "provided complete in place," that is, furnished, installed, tested, and ready for operation and use.

1.1.1.12 Technical Terminology. Unless otherwise stated in the Contract Documents, words which have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

1.1.2 GENERAL DEFINITIONS. These words have the following meaning when capitalized**:**

1.1.2.1 Authority Having Jurisdiction (AHJ). The City of Stockton.

1.1.2.2 Letters of Clarification. written documents furnished by the City before execution of the Contract for Construction, interpreting Drawings and/or Specifications or answering questions of intended bidders, and shall be incorporated in and are a part of the Contract Documents.

1.1.2.3 Architect Supplemental Instruction (ASI). A written and/or graphic instruction from the Architect which modifies the plans or specifications.

1.1.2.4 Architect, Architect-of-Record. A designated Owner Representative, the Architect is responsible for the design of the project, oversight of it during construction, and to make design intent interpretations during construction. Architect is the only party authorized to make changes to the drawings and technical specifications and is authorized to make certain decisions and provide direction during construction, including but not limited to ASI and FO, and as directed by Owner and the Project Engineer. This term also includes the various engineers-of-record on the project. See also Article 7 – The Architect.

1.1.2.5 Bidding Documents. Equivalent to the Procurement and Contracting Requirements, sometimes referred to Division 00.

1.1.2.6 Change Order Request (COR). A request by the Owner or designated Owner Representative to Contract for a change in the work and its resulting change in cost and time.

1.1.2.7 City. Same meaning as Owner, see “Owner, Owner’s Representative”.

1.1.2.8 Construction Manager (CM). A designated Owner Representative, the Construction Manager is responsible for coordinating project activities during construction, including facilitating the flow of information between the Contractor, the Architect and Engineers, the Owner, review agencies, etc. The CM is authorized to make certain decisions and provide direction during construction, and as directed by Owner and the Project Engineer.

1.1.2.9 Contract, Construction Contract. The Contract, or Construction Contract, is the agreement between the Owner and the Contractor and forms a basis for the Contract Documents (see following definition). The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a written Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind between the Architect and Contractor, between the Owner and any Subcontractor or Sub-subcontractor, or between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

1.1.2.10 Contract Documents. The Contract Documents consist of the following: the Construction Contract (sometimes referred to as the Agreement, or Agreement between Owner and Contractor) and any documents listed therein; City of Stockton Standard Specifications; Special Provisions; Project Manual including Technical Specifications; Drawings; Letters of Clarification issued prior to bid; Instructions To Bidders; Advertisement for Bids; Bid Form; List of Subcontractors; Non-Collusion Affidavit; Performance and Payment Bonds; and modifications issued after execution of the Contract including but not limited to Field Orders, Architectural Supplemental Instructions, Response to Requests for Information, Contract Change Directives, and Change Orders.

1.1.2.11 Contract Sum, Contract Price, Contract Amount. The total compensation for the work, including the amount indicated in the Contract and as may be amended by Contract Change Order.

1.1.2.12 Contract Time. The stipulated contract time, as amended only by Contract Change Order, between the Commencement Date identified in the Notice to Proceed and the substantial completion date identified in the Notice of Substantial Completion. See also Article 8 – Contract Time and Schedule.

1.1.2.13 Field Order (FO). A written and/or graphic directive from the Engineer which generally does not change the contract cost (sum) or contract time.

1.1.2.14 Final Completion. Written notice from the Owner to the Contractor that the work has been fully completed, all closeout documents and punchlist work has been completed to the satisfaction of the Owner, the City Council has accepted the projects as such, and notice has been recorded by the County Recorder. See also Article 8 – Contract Time and Schedule.

1.1.2.15 Drawings. Graphic and pictorial portions of the Contract Documents prepared by the Architect, showing the design, location, and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.

1.1.2.16 Engineer, Project Engineer. City of Stockton project coordinator, see also "Owner, Owner's Representative".

1.1.2.17 Inspector-of-Record (IOR). A designated Owner Representative, the project inspector works under the supervision of the Engineer and City Building Official and at the direction of the Architect.

1.1.2.18 Materials or Products. When used in the capitalized form "materials" or "products" means materials, products, equipment, and other physical objects to be incorporated into the Work.

1.1.2.19 Modification. A written amendment to the Contract signed by both parties, a Change Order, a Construction Change Directive, or a written order for a minor change in the Work issued by the Architect.

1.1.2.20 Notice of Final Completion. Written notice from the Owner to the Contractor that the work has been recorded by the County Recorder. See also Final Completion. See also Article 8 – Contract Time and Schedule.

1.1.2.21 Notice to Proceed (NTP). Written notice from the Owner to the Contractor to proceed with the work, setting the date for commencement of Contract Time, otherwise known as the Date of Commencement.

1.1.2.22 Substantial Completion, Notice of Substantial Completion. Written notice from the Owner to the Contractor that the work is sufficiently complete in order that the Owner may take beneficial occupancy of the project. See also Article 8 – Contract Time and Schedule.

1.1.2.23 Owner, Owner's Representative. The City of Stockton and its designated representative. This term is same in meaning as Engineer, or Project Engineer, and may be used to also include any of the Owner's agents such as Architect, Construction Manager, and Inspector of Record. See also Article 2 – The Owner.

1.1.2.24 Plans. Same meaning as Drawings, see "Drawings".

1.1.2.25 Project. The total construction of which the Work performed in accordance with the Contract Documents may be the whole or a part and which may include construction by the Owner or by separate Contractors.

1.1.2.26 Project Manual. The volume usually assembled for the Work which may include, without limitation, the bidding requirements, sample forms, Conditions of the Contract, and Specifications.

1.1.2.27 Punchlist. List of items for correction, issued upon any intermediate or final inspection of the project by Owner, Inspector of Record, Architect, and their various representatives.

1.1.2.28 Record Documents. Record set of Plans and specifications including all Letters of Clarification, Architects Supplemental Instructions, Field Orders, Construction Change Directives, Change Orders, and minor adjustments made in the field during construction which would otherwise be undocumented. Record Documents are to be kept current at jobsite, this being a pre-requisite for processing monthly Payment Applications.

1.1.2.29 Schedule of Values. A document provided by Contractor for review by Engineer detailing the cost of the project, each line item inclusive of all markups and expense, and used as the basis for applications for payment.

1.1.2.30 Site. The "site" refers to the grounds of the Project as described in the Contract Documents and such adjacent lands as may be directly affected by the performance of the Work.

1.1.2.31 Specifications. The Specifications are that portion of the Contact Documents consisting of the written requirements for material, equipment, construction systems, instructions, quality assurance standards, workmanship, and performance of related services. See also Technical Specifications.

1.1.2.32 Submittal. When used in the capitalized form “Submittal” means product data, shop drawing, sample, or similar item or document required to be submitted to Architect for review.

1.1.2.33 Sum. Same as Contract Sum.

1.1.2.34 Technical Specifications. The Technical Specifications are that portion of the overall Specifications beginning with Division 01 - General Requirements through last applicable division, these sections being the responsibility of the Architect and its engineers.

1.1.2.35 Time. Same as Contract Time.

1.1.2.36 Warranty. Minimum one year warranty or as specified, commencing on the date of the Notice of Substantial Completion.

1.1.2.37 Work. The term "work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment and services provided or to be provided by the Contractor to fulfill the Contractor's obligations, completed in a good and workmanlike manner. The Work may constitute the whole or a part of the Project.

1.2 DOCUMENTS INCLUDED BY REFERENCE

1.2.1 GENERAL. Where the Contract Documents require compliance with referenced documents not bound with the Contract Documents, the referenced documents shall have full force and effect as though printed in the Specifications, except where the specific Contract Document requirements are more stringent or exceed the requirements of the reference documents.

1.2.2 STANDARDS. Any reference to a standard of any society, institute, association, utility or governmental authority is a reference to the organization's standards, which are in effect at the date of the Contractor's proposal. If applicable standards are revised prior to completion of any part of the Work, the Contractor may, if acceptable to Architect, perform such Work in accordance with the revised standards. Architect will furnish, upon request, information as to how copies of the standards referred to may be obtained.

1.2.3 MANUFACTURER'S REQUIREMENTS. Reference to manufacturer's instructions, directions, or requirements shall mean the printed literature furnished by the manufacturer for use of that manufacturer's product or material under conditions similar to those found in the Work. Quality shall meet or exceed descriptions and representations made in manufacturer's promotional literature.

1.2.4 LAWS. Each and every provision of law required by law to be inserted in this Contract shall be deemed to be inserted herein, and the Contract shall be read and enforced as though it were included herein, and if through mistake or otherwise any such provision is not inserted, or is not correctly inserted, then upon application of either party the Contract shall be amended in writing to make such insertion or correction.

1.3 DOCUMENT INTERPRETATION AND CORRELATION

1.3.1 COMPLETE PROJECT. The Contract Documents are intended to include all items required for the proper execution and completion of the Work by the Contractor. The Work shall include any related construction or service not specifically called for, but necessary to complete Work called for, if that related Work or service is commonly associated with the Work called for and its inclusion is reasonably inferable from the Contract Documents.

1.3.2 COMPLIMENTARY DOCUMENTS. The Contract Documents are complimentary, and what is required by one shall be as binding as if required by all. In general, the Drawings show dimensions, position and scope of construction; and the Specifications set forth the quality of products, materials, and execution. Any Work called for in the Drawings and not mentioned in the Specifications, or vice versa, shall be performed as though fully set forth in both.

1.3.3 CONSISTENCY. Work not particularly detailed, identified, graphically represented, or specified shall be the same as similar parts that are detailed, identified, graphically represented or specified.

1.3.4 DIMENSIONS. Dimensions of Work shall not be determined by scale or rule or interpretation of electronic documents. Annotated dimensions shall be followed at all times. If Contractor believes that the annotated dimensions on drawings are not adequate for construction without scaling, contractor shall request clarification pursuant to Sub-Article 3.3.

1.3.5 SUBDIVISION OF WORK. Organization of the Specifications into divisions, Sections, and Articles, or naming or numbering of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

1.4 DISCREPANCIES IN CONTRACT DOCUMENTS

1.4.1 DOCUMENT HIERARCHY. In the event there is a discrepancy between any of the various Contract Documents the following rules shall apply in the order listed, without limiting Contractor's obligation to identify conflicts for resolution by the Architect in accordance with Sub-Article 3.3 and without limiting the Architect's right to interpret the documents:

1.4.1.1 Most recently released documents govern over previously released documents.

1.4.1.2 The Owner's Standard Specifications and Special Provisions govern over all other Contract Documents except in matters pertaining to the scope or quality of the Work which shall be governed by the Drawings and Specifications.

1.4.1.3 In case of discrepancy between the Drawings and Specifications, the Drawings shall govern in matters of quantity, the Specifications in matters of quality.

1.4.1.4 Each Contract Document shall govern in that subject or purpose for which it was specifically or primarily prepared.

1.4.2 DISCREPANCIES WITHIN DOCUMENTS. In case of discrepancy within the Drawings involving quantities or within the Specifications involving qualities, the greater quantity and the higher quality shall be provided. In the case of discrepancy within other documents, the more stringent requirement shall be applied.

1.5 USE OF DOCUMENTS

1.5.1 USE AND COPYRIGHTS. The Drawings, Specifications and other documents prepared on behalf of the Owner by the Architect and the Architect's consultants, including those in electronic format, and copies thereof are the property of the Owner and are furnished to the Contractor for use solely with respect to this Project. The Contractor may retain one record set. Neither the Contractor nor any Subcontractor, Sub-subcontractor or material or equipment supplier shall own or claim a copyright in the Drawings, Specifications and other documents prepared by the Architect or the Architect's consultants, and unless otherwise indicated the Architect and the Architect's consultants shall be deemed the authors of them and will retain all common law, statutory and other reserved rights, in addition to the copyrights. They are not to be used by the Contractor or any Subcontractor, Sub-subcontractor or material or equipment supplier on other projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner, Architect and the Architect's consultants. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with this Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' copyrights or other reserved rights.

1.5.2 ELECTRONIC DOCUMENTS. Any electronic version of the Contract Documents may vary significantly from the printed version due to manual edits of the printed versions related to agency review, revisions or Letters of Clarification, corruption of the electronic files or medium, or other causes. Electronic versions are not part of the contract documents. Any party attempting to make any use of electronic versions of contract documents on the Project shall assume full responsibility for any errors, omissions, or discrepancies with the Contract Documents therein.

1.6 WRITTEN NOTICE.

Any notice from one party to the other or otherwise under the Contract shall be in writing and shall be dated and signed by the party giving such notice or by a duly authorized representative of such party. Any such notice shall not be effective for any purpose unless served by personal delivery to a designated representative for this Project of the party for which it was intended or unless delivered at, or sent by registered or certified mail to, the last business address of the party for which it was intended, known to the party giving notice.

1.7 GOVERNING LAW

The Contract shall be governed by the law of the place where the Project is located.

1.8 SUCCESSORS AND ASSIGNS

The Owner and the Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to the other party hereto and to partners, successors, assigns, and legal representatives of such other party in respect to covenants, agreements, and obligations contained in the Contract Documents. Neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make such an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

1.9 RIGHTS AND REMEDIES

1.9.1 DUTIES AND OBLIGATIONS CUMULATIVE. Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

1.9.2 NO WAIVER. No action or failure to act by the Inspector, the Owner, the Architect or the Contractor shall constitute a waiver of a right or duty afforded them under the Contract Documents, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed in writing.

1.10 INTEREST

Payments due and unpaid under the Contract shall bear interest from the date payment is due at such rate as the parties may agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

ARTICLE 2 - THE OWNER

2.1 DEFINITION

The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate a project manager who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Paragraph 7.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's designated project manager. Owner and City have the same meaning.

2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

2.2.1 FINANCING AND FUNDING. At the request of the Contractor, the Owner will, prior to execution of the Agreement and promptly from time to time thereafter, furnish to the Contractor reasonable evidence that financial arrangements have been made to fulfill the Owner's obligations under the Contract.

2.2.2 PERMITS AND FEES. Except for permits and fees, including those required under Paragraph 3.2.1, which are the responsibility of the Contractor under the Contract Documents, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for use or occupancy of permanent structures or for permanent changes to existing facilities.

2.2.3 TESTING LAB AND INSPECTION. Pursuant to Article 6 of these Special Provisions, the Owner will select and pay an independent testing laboratory to conduct tests and inspections required under California Code of Regulations, Title 24.

2.2.4 NOT USED.

2.2.5 SITE SURVEY. When required by the scope of the Project, the Owner will furnish a legal description and a land survey of the Site, giving, as applicable, grades and lines of streets, alleys, pavements, adjoining property, rights-of-way, easements, encroachments, zoning, deed restrictions, boundaries, and contours of the Site. Surveys needed to perform the work shall be provided by the Contractor.

2.2.6 GEOTECHNICAL REPORTS. Copies of such reports will be made available to the Contractor at no expense. Any such reports were generated for the purpose of aiding in the design of the project and are not a part of the Contract Documents. The Owner will make these documents available to the Contractor for reference only. Contractor is solely responsible for its conclusions

drawn from them. The Contractor may conduct its own geotechnical investigations at the site. At the Owner's request, the Contractor shall make available to the Owner the results of any such investigation.

2.2.7 PROJECT INFORMATION. Upon the request of the Contractor, Owner will make available such existing information regarding utility services and Site features, including existing construction, related to the Project as is available from Owner's records. Such information is not part of the contract documents and the Contractor is solely responsible for the conclusion drawn from such information. If any such information conflicts with information in the Contract Documents, or appears incorrect based upon Contractor's Site inspection or knowledge of the Project, Contractor shall notify the Architect per Sub-Article 3.3.

2.2.8 REASONABLE PROMPTNESS. Information or services under Owner's control will be furnished by the Owner with reasonable promptness to avoid delay in the orderly progress of the Work.

2.3 OWNER'S RIGHTS

2.3.1 STOPPING THE WORK. If the Contractor fails to correct nonconforming Work, as required by Sub-article 12.2, or persistently fails to carry out Work in accordance with the Contract Documents, the Owner by written order signed personally or by an agent specifically so empowered by the Owner in writing, may order the Contractor to stop the Work or any portion thereof, until the cause for such order has been eliminated. The right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Article 13.

2.3.2 CARRYING OUT THE WORK. If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a 3 day period after receipt of written notice or the time period expressly stated in the written notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may correct such deficiencies without prejudice to other remedies the Owner may have. In such case, the Contractor will be back charged all costs associated with correcting such deficiencies, including compensation for additional professional and internally generated services and expenses made necessary by such default, neglect, or failure.

2.3.3 REMOVAL OF CONTRACTOR'S STAFF. Owner shall have the right, but not the obligation, to require the removal from the Project of any superintendent, staff member, agent, or employee of any Contractor, Subcontractor, material or equipment supplier, etc., for cause. See also under paragraph 3.1.7.

THE CONTRACTOR

3.1 GENERAL

3.1.1 DEFINITION. The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The term "Contractor" means the Contractor or the Contractor's authorized representative.

3.1.2 PERFORMANCE. The Contractor shall perform the Work in accordance with the Contract Documents. Contractor shall do no additional work without Architect's clarifying instructions, approved Change Order or as otherwise set forth in Article 9.

3.1.3 OBLIGATIONS NOT CHANGED. The Contractor shall not be relieved of obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the

Architect or Inspector, or by tests, inspections, or approvals required or performed by persons other than the Contractor.

3.1.4 USE OF SITE. The Contractor shall confine operations at the site to areas permitted by law, ordinances, permits, and the contract documents and shall not unreasonably encumber the site with materials or equipment.

3.1.5 ACCESS TO WORK. The Contractor shall provide the Owner, the Architect, and Inspectors, access to the Work in preparation and progress wherever located. Contractor shall maintain site, including weatherization and dewatering, to allow performance of work and ready vehicular and pedestrian access to all portions of the site where work is scheduled.

3.1.6 WORKING HOURS. Work shall be performed during regular working hours except in the event of an emergency. If required to keep project on schedule, work may be performed outside of regular working hours only with the advance written consent of the Owner.

3.1.7 FULL TIME SUPERINTENDENT. The Contractor shall provide a competent, English-speaking superintendent and necessary assistants who shall be in attendance full-time at the Project Site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor. City has the right of refusal of the Superintendent proposed for use by Contractor on this project. Contractor shall submit Superintendent qualifications, relevant experience, and references to the City for review and approval prior to Contractor appointment of Superintendent to the project. City retains the right of removal of the Superintendent based on substantive nonperformance as may be determined by City, Contractor to submit for City approval the qualifications of a substitute Superintendent as outlined above.

3.1.8 DAILY CONSTRUCTION REPORTS. The Contractor shall deliver daily reports, on forms pre-approved by the Owner, to the Owner's Project Inspector, which shall contain all of the following:

3.1.8.1 Names of project and contractor.

3.1.8.2 Weather, temperature, and unusual site conditions.

3.1.8.3 A brief description of the day's work activities, including location, and any unusual problems.

3.1.8.4 A list of any unforeseen conditions and unanticipated delays.

3.1.8.5 A description of any problems that might affect progress, which shall relate to the Project Schedule.

3.1.8.6 Labor quantities, by trade, including subcontractors.

3.1.8.7 A list of all large equipment used on site, whether owned, leased, or rented.

3.1.9 NOT USED.

3.2 PERMITS, CODES AND AGENCY REQUIREMENTS

3.2.1 PAYMENT. The Contractor shall secure and pay for all permits and governmental fees, licenses, and inspections necessary for proper execution and completion of the Work which are customarily secured after execution of the Contract and are legally required by any authority having jurisdiction over the Project, except those identified as the Owner's responsibility in Sub-article 2.2. The Owner will reimburse the Contractor for permanent utility connection fees necessary for the completion of the Work. Proper documentation of fees shall be submitted through the Architect. No mark up shall be allowed the Contractor on these reimbursable charges. These reimbursable charges shall not be included in base bid.

3.2.2 COMPLIANCE. The Contractor shall comply with and give notices required by any law, ordinance, rule, regulation, and lawful order of public authorities bearing on performance of the Work. Specific duties of the Contractor shall be in accordance with Title 24 of the California Code of Regulations and in compliance with the City of Stockton Community Workforce Training Agreement CWTA as described in the Construction Contract.

3.2.3 RESPONSIBILITY. Contractor shall take responsibility and shall require Subcontractors to take responsibility for knowledge of the requirements of building codes and of utility companies and other agencies with jurisdictional authority at the Site, which knowledge is pertinent to the proper execution of the Work of this Contract. Any Work shown in the contract document that is not in compliance with such requirements shall be treated as an Observed Discrepancy per Article 3.3.7. No work shall be performed that is in violation of any applicable building code.

3.3 PLANNING, SUPERVISION AND CONSTRUCTION PROCEDURES

3.3.1 CONSTRUCTION MEANS AND METHODS. The Contractor shall plan, supervise, and direct the Work using the Contractor's best skill and attention. The Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences, procedures, and coordinating all portions of the Work under the Contract, unless Contract Documents give other specific instructions concerning these matters. If any portion of the Project is performed by other contractors retained directly by the Owner, Contractor shall be responsible for the coordination and sequencing of its Work with that of the other contractors so as to avoid any impact on the Project Schedule pursuant to the requirements of Article 13.

3.3.2 EXAMINATION OF WORK ALREADY PERFORMED. The Contractor shall be responsible for examination of portions of Work already performed under this Contract or other contracts to determine if such portions are suitable to receive subsequent work of this contract.

3.3.3 ADVANCE NOTICE TO INSPECTORS. Contractor shall become familiar with testing and inspection requirements of the Contract Documents and notify Inspectors a sufficient time in advance of the work's readiness for required observation or inspection so that the Inspector may arrange for same.

3.3.4 PLANNING AND REVIEW OF FIELD CONDITIONS AND CONTRACT DOCUMENTS: The Contractor shall take responsibility for planning and coordinating the Work to be performed by the Contractor and its various subcontractors, including identifying and rectifying potential conflicts in scheduling, access, and final installed position of each portion of the Work and including the preparation of required coordination drawings. Before starting each portion of the Work, the Contractor, together with the subcontractors who will perform that portion of the Work shall review the Site to observe and take field measurements of conditions which may affect the Work, make such investigation as they deem necessary to fully understand those conditions, and carefully study and compare the various Drawings and other Contract Documents with each other and with observed site conditions relative to that portion of the Work. These planning obligations shall be performed early enough to allow reasonable time for a response from the Architect to any RFI related to planning that portion of the Work.

3.3.5 REQUESTS FOR INFORMATION. An RFI is a written request for information submitted in the form required by the Contract Documents. If the contractor is unsure of the meaning or requirements of the Contract Documents, discovers an unforeseen condition as described in Article 10.1, or believes additional information is required for the proper performance of the Work, Contractor shall prepare an RFI asking the Architect for clarification or direction. The response to an RFI shall not be interpreted as change in the Work resulting in a change in Contract Sum or Contract Time. RFI response is to Contractor's document and is not sealed by Architect. See Division 1 – General Requirements for certain other requirements as may apply.

3.3.6 UNDERGROUND UTILITIES. It shall be solely the responsibility of the Contractor to timely notify all public and private utilities serving the Site prior to commencing work. The Contractor shall notify and receive clearance from any cooperative agency, such as Underground Service Alert. Refer to sub-article 10.1.9 regarding discovery of utility lines not shown in contract documents.

3.3.7 OBSERVED DISCREPANCY. An Observed Discrepancy is defined as any existing or potential error, omission, inconsistency, ambiguity, violation of code requirements, lack of detail, or lack of explanation in the Contract Documents, or any inconsistency between the Contract Documents or the Record Drawings and site conditions, observed by the Contractor or its Subcontractors, material or equipment suppliers. Contractor shall require its Subcontractors, and material or equipment suppliers to immediately report all Observed Discrepancies. Contractor shall immediately report all Observed Discrepancies to Owner in an RFI. No Work that might be affected by an Observed Discrepancy shall be performed before receipt of Architect's response.

3.3.8 CLAIMS. If the Contractor believes that additional cost or time is involved because of clarifications or instructions issued by the Owner in response to the Contractor's RFI's pursuant to this Sub-Article 3.3, Contractor may make Claim as provided in Article 10. Claim may be in the form of a Proposed Change Order (PCO) pursuant to Article 9.

3.3.9 NON-COMPLIANCE. If the Contractor or its Subcontractors, employees, or agents performs any Work under the Contract Documents, without complying with the requirements of this Sub-Article 3.3, and that Work is subsequently corrected to comply with the Contract Documents, code requirements, or to properly coordinate with or integrate into adjacent Work, Contractor shall bear all costs arising therefrom including, the cost of correction and related professional services and inspection.

3.4 LABOR AND MATERIALS

3.4.1 PROVISION. Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, material, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work whether temporary or permanent and whether or not incorporated or to be incorporated in the Work. The Contractor shall provide, and cause each Subcontractor to provide, competent and adequate staff as necessary for the proper administration, coordination, supervision, and superintendence of its portion of the Work; organize the procurement of all materials and equipment so that the materials and equipment will be available at the time they are needed for the Work; and keep an adequate force of skilled and fit workers on the job to complete the Work in accordance with all requirements of the Contract Documents.

3.4.2 PROTECTION OF WORK AND STORED MATERIALS. The Contractor shall remove all mud, water, or other elements as may be required for the proper protection and prosecution of its Work. The Contractor shall at all times provide heat, coverings, and enclosures necessary to maintain adequate protection against weather so as to preserve the Work and stored Materials, free from moisture damage or other degradation due to exposure.

3.4.3 TAXES. The Contractor shall pay sales, use and similar taxes on the Work of the Contractor which are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

3.4.4 DISCIPLINE. The Contractor shall enforce strict discipline and good order among the Contractor's employees, Subcontractors and other persons carrying out the Contract. The Contractor shall not permit employment of unfit persons or persons not skilled in tasks assigned to them.

3.5 DOCUMENTS AND SAMPLES AT THE SITE

3.5.1 COPIES OF DOCUMENTS. The Contractor shall maintain at the Site for the Owner one applicable copy of Title 24 and record copy of the Drawings, Specifications, Letters of Clarification, Change Orders, and other modifications, in good order and marked currently to record changes and selections made during construction. In addition, the Contractor shall maintain at the Site approved Shop Drawings, Product Data, Samples, and similar required submittals. These documents shall be available to the Architect and the Owner's Inspector and shall be delivered to the Owner upon completion of the Work.

3.5.2 AS-BUILT REDLINE DRAWINGS. The Contractor shall prepare and maintain on a current basis an accurate and complete set of As-Built drawings showing underground utilities, including low voltage lines with indications of As-Built depth and location from buildings or other permanent surface features. The Contractor shall also record any change in location from that shown in the Contract Documents, of any significant building component or system which will be concealed from view. Inspector shall have the authority to determine which changes in location are to be recorded. The Contractor shall update the As-Built drawings weekly. The Project Inspector will verify that record drawings are up-to-date and if they are not, the Project Inspector will not approve the current pay request. The As-Built drawings shall be kept at the Site and available for inspection by the Owner and the Architect. On completion of the Work and prior to Application for Final Payment, the Contractor shall provide one complete set of Record Drawings to the Owner, certifying them to be a complete and accurate reflection of the actual construction conditions of the Work.

3.6 CUTTING AND PATCHING

3.6.1 SCOPE. The Contractor shall be responsible for cutting, fitting or patching required to complete the Work or to make its parts fit together properly.

3.6.2 CONSTRUCTION BY OTHERS. The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or separate contractors by cutting, patching, excavating, or otherwise altering such construction. The Contractor shall not cut or otherwise alter such construction by the Owner or a separate contractor except with written consent of the Owner and of such separate contractor; such consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold from the Owner or a separate contractor the Contractor's consent to cutting or otherwise altering the Work. All cutting and patching shall be done promptly to avoid delay.

3.6.3 STRUCTURAL MEMBERS. New or existing structural members and elements, including reinforcing bars and seismic bracing, shall not be cut, bored, or drilled except by written authority of the Architect or allowed in the Contract Documents. Work done contrary to such authority is at the Contractor's risk, subject to replacement at its own expense and without reimbursement under the Contract.

3.6.4 SUBSEQUENT REMOVAL. Permission to patch any areas or items of nonconforming Work shall not constitute a waiver of the Owner's or the Architect's right to require complete removal and replacement of the areas of items of the Work if, in the opinion of the Architect or the Owner, the patching does not satisfactorily restore quality and appearance of the Work or does not otherwise conform to the Contract Documents.

3.7 CLEAN UP

3.7.1 CONTRACTORS RESPONSIBILITY. The Contractor shall keep the Site and surrounding area free from accumulation of waste material and rubbish caused by operations under the Contract.

The Contractor shall remove from and about the Site the waste materials, rubbish, tools, construction equipment, machinery, and materials no longer required for the Work.

3.7.2 FAILURE TO CLEAN UP. If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so, and the cost thereof shall be backcharged to the Contractor.

3.7.3 ABANDONED PROPERTY. When directed by the Owner or the Architect, Contractor shall dismantle temporary structures, if any, and remove from the Site all construction and installation equipment, fences, scaffolding, surplus materials, rubbish, and supplies belonging to Contractor. If the Contractor does not remove the tools, equipment, machinery, and materials within 14 days of being so directed, then they shall be deemed abandoned, and the Owner can dispose of them for its own benefit in whatever way it deems appropriate.

3.8 ROYALTIES, PATENTS AND COPYRIGHTS

3.8.1 PAYMENT AND INDEMNITY. The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims of infringement of copyrights and patent rights and shall hold the Owner and the Architect harmless from loss on account thereof but shall not be responsible for such defense or loss when a particular design, process, or product of a particular manufacturer is required by the Contract Documents. However, if the Contractor has reason to believe the required design, process, or product is an infringement of a patent, the Contractor shall be responsible for such loss unless such information is promptly furnished to the Architect.

3.8.2 ARCHITECTS REVIEW. The review by the Architect of any method of construction, invention, appliance, process, article, device, or material of any kind shall be for its adequacy for the Work and shall not be an approval for the use by the Contractor in violation of any patent or other rights of any person or entity.

3.9 INDEMNIFICATION

3.9.1 GENERAL. To the fullest extent permitted by law, the Contractor shall defend, indemnify, and hold harmless the Owner, Architect, Architect's consultants, and their respective agents, employees, officers, and directors, from and against claims, damages, losses, and expenses (including, but not limited to attorneys' fees and costs including fees of consultants) arising out of or resulting from: performance of the Work (including, but not limited to) the Contractor's or its Subcontractor's use of the Site; the Contractor's or its Subcontractor's construction of the Project, or failure to construct the Project, or any portion thereof; the use, misuse, erection, maintenance, operation, or failure of any machinery or equipment including, but not limited to, scaffolds, derricks, ladders, hoists, and rigging supports, whether or not such machinery or equipment was furnished, rented, or loaned by any of the Indemnitees; or any act, omission, negligence, or willful misconduct of the Contractor or its Subcontractors or their respective agents, employees, material or equipment suppliers, invitees, or licensees but only to the extent caused in whole or in part by the acts or omissions of the Contractor, its Subcontractors, anyone directly or indirectly employed by any of them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity, which would otherwise exist as to a party, person, or entity described in this paragraph. Except as otherwise provided by law, the indemnification provisions above shall apply regardless of the existence or degree of fault of Indemnitees. The Contractor, however, shall not be obligated to indemnify Indemnitees for Claims arising from conduct delineated in Civil Code Section 2782.

3.9.2 NO LIMITATION. The Contractor's obligation to indemnify and defend the Indemnities hereunder shall include, without limitation, any and all claims, damages, and costs: for injury to persons and property and death of any person; for breach of any warranty, express or implied; for failure of the Contractor to comply with any applicable governmental law, rule, regulation, or other requirement; and for products installed in or used in connection with the Work.

ARTICLE 4 - SUBCONTRACTORS

4.1 DEFINITIONS

4.1.1 SUBCONTRACTOR. A Subcontractor is a person or entity, who has a contract with the Contractor to perform a portion of the Work at the Site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor.

4.1.2 SUB-SUBCONTRACTOR. A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the Site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

4.1.3 SPECIALTY CONTRACTORS. If a Subcontractor is designated as a "Specialty Contractor" as defined in Section 7058 of the Business and Professions Code, all of the Work outside of that Subcontractor's specialty shall be performed in compliance with the Subletting and Subcontracting Fair Practices Act, Public Contract Code Sections 4100, et seq.

4.2 SUBSTITUTION OF SUBCONTRACTORS

4.2.1 CONSENT OF OWNER. Contractor shall not substitute any person or entity as a Subcontractor in place of a Subcontractor listed in the original bid without written consent of Owner and only for those circumstances set forth under Public Contract Code Section 4107 or as otherwise provided by law.

4.2.2 REMOVAL OF SUBCONTRACTORS. The Owner may direct the Contractor to remove and replace a Subcontractor for any of the reasons described in Public Contract Code Section 4107, subdivision (a), or for failure to perform in compliance with the Contract Documents.

4.2.3 REPLACEMENT AT NO COST. Contractor shall replace any substituted or removed Subcontractor with a qualified Subcontractor acceptable to both the Owner and the Contractor with no increase in the Contract Sum or Time.

4.2.3.1 The awarding authority shall mail a written notice to the listed Subcontractor giving reasons for the proposed substitution. The listed Subcontractor shall have 5 working days from the date of such notice within which to file with the awarding authority written objections to the substitution.

4.2.3.2 Failure to file written objections pursuant to the provisions of this Paragraph 4.2.3 within the times specified herein shall constitute a waiver of objection to the substitution by the listed Subcontractor and, where the ground for substitution is an inadvertent clerical error, an agreement by the listed Subcontractor that an inadvertent clerical error was made.

4.2.3.3 If written objections are filed, the awarding authority shall give 5 days notice to the Contractor and to the listed Subcontractor of a hearing by the awarding authority on the Contractor's request for substitution as provided in Public Contract Code Section 4107. The determination by the awarding authority shall be final.

4.2.4 SUBCONTRACTUAL RELATIONS. By appropriate agreement, written where legally required for validity, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all obligations and responsibilities, which the Contractor, by the Contract Documents, assumes toward the Owner and the Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and the Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where applicable, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound. Upon written request of the Subcontractor, the Contractor shall identify to the Subcontractor the terms and conditions of the proposed subcontract agreement, which may be at variance with the Contract Documents. Subcontractors shall similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

4.3 CONTINGENT ASSIGNMENT OF SUBCONTRACTS

Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner provided that: 1) Assignment is effective only after termination of the Contract with the Contractor by the Owner for cause pursuant to Article 17 and only for those subcontract agreements which the Owner accepts by notifying the Subcontractor in writing; and 2) Assignment is subject to the prior rights of the surety, if any, obligated under any bond relating to the Contract.

4.4 PROVIDE SUBCONTRACTOR INFORMATION

Within 5 days of the date that the Owner executes the Agreement, the Contractor shall provide the Owner with a typed list of all subcontractors (including those which need not be listed in the Bid), which shall include the following information: business name and mailing address; telephone and facsimile numbers; contractor's license type and number; name of contact person and portion of Work to be performed.

4.5 PROVIDE SUBCONTRACTOR CONTRACTS

If requested by Owner, Contactor shall, within 5 days of request, provide Owner with copies of signed contracts with all subcontractor (including those which need not be listed in the Bid), copies of bid proposals from all accepted sub-bidders, and copies of any Subcontractor bonds required by the Contract Documents or by the Contractor.

4.6 INDEMNITY

Contractor shall require the following language in each subcontract: Subcontractor shall defend, indemnify, and hold harmless the Owner, the Architect, and the Architect’s consultants, and their respective agents, employees, officers, and directors from and against claims, damages, losses, and expenses, including, but not limited to, attorneys’ fees and costs, (including consultants) arising out of or resulting from: performance of the Work (including, but not limited to) the Subcontractors’ use of the Site; the Subcontractors’ construction of the Project or failure to construct the Project or any portion thereof; the use, misuse, erection, maintenance, operation, or failure of any machinery or equipment, including, but not limited to, scaffolds, derricks, ladders, hoists, and rigging supports, whether or not such machinery or equipment was furnished, rented, or loaned by any of the

Indemnitees; or any act, omission, negligence, or willful misconduct of the Subcontractors or their respective agents, employees, material or equipment suppliers, invitees, or licensees but only to the extent caused in whole or in part by the acts or omissions of the Subcontractors, anyone directly or indirectly employed by any of them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity, which would otherwise exist as to a party, person, or entity described in this paragraph. Except as otherwise provided by law, the indemnification provisions above shall apply regardless of the existence or degree of fault of Indemnitees. The Subcontractor, however, shall not be obligated to indemnify Indemnitees for Claims arising from conduct delineated in Civil Code Section 2782.

4.7 JOINT AND SEVERAL LIABILITY

In the event more than one Subcontractor is connected with an accident or occurrence covered by this indemnification, then all such Subcontractors shall be jointly and severally responsible to each of the Indemnitees for indemnification, and the ultimate responsibility among such indemnifying Subcontractors for the loss and expense of any such indemnification shall be resolved without jeopardy to any Indemnitee. The provisions of the indemnity provided for herein shall not be construed to indemnify any Indemnitee for its own negligence if not permitted by law or to eliminate or reduce any other indemnification or right which any Indemnitee has by law or equity.

ARTICLE 5 - SUBMITTALS, DEFERRED APPROVALS, AND SUBSTITUTIONS

5.1 GENERAL

5.1.1 SHOP DRAWINGS. Shop Drawings are drawings, diagrams, schedules and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Work which requires additional information to, or greater detail than, that shown in the Drawings to properly coordinate with related Work and to ensure compliance with specified requirements. Considering adjacent Work and field conditions, the shop drawings shall provide all information not shown in the contract documents but required for coordination with related Work and proper fabrication and installation, of the illustrated Work.

5.1.2 PRODUCT DATA. Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work

5.1.3 SAMPLES. Samples are physical examples of materials, equipment or workmanship identical to that being proposed for inclusion in the Work and establish standards by which the Work will be judged.

5.1.4 PURPOSE OF SUBMITTALS. Shop Drawings, Product Data, Samples and similar submittals are referred to as Submittals and are not Contract Documents. The purpose of their submittal is to demonstrate for those portions of the Work for which submittals are required by the Contract Documents the way by which the Contractor proposes to conform to the specified requirements and the design concept expressed in the Contract Documents. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals which are not required by the Contract Documents may be returned by the Owner without action.

5.1.5 DEFERRED APPROVAL. A Deferred Approval is a portion of the Work that requires design by the Contractor before the Authority Having Jurisdiction's review process can be completed. A Deferred Approval consists of drawings, specifications, and/or calculations, prepared by, or under the supervision of, a qualified design professional, for approval by regulating agencies, at the expense of the Contractor. Once approved, a deferred approval will become part of the Contract Documents, but responsibility for design of that portion of the Work will remain with the Contractor.

5.1.6 NO WORK UNTIL APPROVAL. The Contractor shall not perform any portion of the Work for which the Contract Documents require Submittal and review of Submittals until the respective Submittal review process is complete with final action is taken by the Architect.

5.1.7 OWNER'S PROPERTY. All Submittals shall become the Owner's property.

5.1.8 CONTRACTOR RESPONSIBILITIES. By approving and submitting a Submittal, Contractor represents that Contractor has verified that the Submittal is complete, and is not a substitution. Contractor further represents that Contractor has checked and coordinated the information contained in the submittals with related submittals and the requirements of the Contract Documents, has verified dimensions, and field conditions related thereto, or will do so in a timely manner to insure proper fitting of the work and avoidance of delay or additional costs. Contractor shall take responsibility for any delay or cost of professional services related to Submittals being returned for resubmittal and re-review, due to incompleteness, inaccuracy, or non-compliance with Contract Documents.

5.1.9 DEVIATIONS. Application for deviations from the Contract Documents shall be in the form of an RFI, Substitution Request, or Change Order Request and shall not be made through the Submittal process. The Work shall be in accordance with approved Submittals except that the Contractor shall not be relieved of responsibility for errors, omissions, or deviations from requirements of the Contract Documents by the Architect's approval of Submittals, except for minor deviations documented as described in this Paragraph. Minor deviations necessary to resolve conflicts with manufacturers requirements, to accurately describe attributes of specified Materials, to properly integrate the specified Work into the Project, or similar deviations that would not affect Project quality, cost, or time, or conflict with adjacent Work, may be approved through the Submittal Process if the deviation is graphically highlighted in the Submittal and identified in writing with a description of the deviation.

5.2 SUBMISSION PROCESS

5.2.1 GENERAL. Submittals shall be submitted in the format and number required in Division 1 of the specifications and in accordance with Contractor's progress schedule and the requirements of this Article.

5.2.2 SCHEDULE. Contractor shall allow adequate time for preparation of Submittals, review and processing of subcontractor's Submittals and review by Owner, Architect and Architect's Consultants. Review times will vary depending on complexity and scope of Submittals and the potential for re-submittals. In any case, Contractor shall allow at least 30 days for Owner's Submittal review process. For Materials that must be purchased within the first 60 days of the contract time, request may be made for expedited review. Request for expedited review shall be in writing and shall include the all pertinent schedule information. Owner and Architect will make every reasonable effort to perform the expedited review in conformance with the schedule information provided. See Division 1 – General Requirements for certain other requirements as may apply.

5.2.3 CONTRACTOR REVIEW. The Contractor shall review for compliance with the Contract Documents, approve and submit to the Architect, Submittals required by the Contract Documents with reasonable promptness and in such sequence as to cause no delay in the Work

or in the activities of the Owner or of separate contractors. Any Submittal that is incomplete, not marked as reviewed for compliance with the Contract Documents by the Contractor, or contains any deviation from the Contract Documents, except as allowed in Paragraph 5.1.9, may be returned without review.

5.2.4 ARCHITECT REVIEW. The Architect will review and take appropriate action upon the Contractor's Submittals but only for the limited purpose of checking for general conformance with specified requirements and the design concept expressed in the Contract Documents. Review of Submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, fitting with other Work, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsible of the Contractor as required by the Contract Documents. The Architect's action will be taken with such reasonable promptness, while allowing sufficient time in the Architect's professional judgment to permit adequate review. The Architect's review of the Contractor's Submittals shall not relieve the Contractor of the obligations under this Article or responsibility for errors in Submittals, for proper fitting of the Work, or from the necessity of furnishing any Work required by the Contract Documents, which may not be indicated on Submittals when reviewed. The Architect's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the Architect, of any construction means, methods, techniques, sequences or procedures. The Architect's approval of a specific item shall not indicate acceptance of an assembly of which the item is a component. See Division 1 – General Requirements for certain other requirements as may apply.

5.2.5 REVIEW COMMENTS. Contactor shall comply with Architects review comments. If resubmittal is required by Architect, the Contractor shall revise Submittal to respond to review comments and shall resubmit the required number of revised Submittals. Contractor shall direct specific attention in writing or on resubmitted Submittal to revisions other than those required by the Architect on previous submissions. In the absence of such written notice the Architect's approval of a resubmission shall not apply to such revisions. Professional services required for more than 1 re-review of required Submittals are subject to charge to the Contractor pursuant to Sub-article 10.4.

5.2.6 DEFERRED APPROVALS. Deferred approvals shall be submitted and processed as described above with the additional requirement for the Contractor to obtain approval from regulatory agencies. Communication between the reviewing agencies and the Contractor shall be through the Architect. Contractor and Contractor's design professional shall meet with the reviewing agency and take all other steps necessary to obtain approval of their design. Contractor shall allow adequate time for agency review. Delay due to agency's review of a Deferred Approval shall be the responsibility of the Contractor. Contractor is responsible for all costs associated with deferred approvals, including changes in Work scope or schedule caused by agency requirements. The requirements of the regulating agencies on a deferred approval shall take precedence over any previously issued Letters of Clarification, drawing or specification, with no change in contract sum or time. No progress payment will be approved on any Work subject to deferred approval until agency approval has been obtained.

5.3 SUBSTITUTIONS

5.3.1 GENERAL. Unless the specifications state that no substitution is permitted, whenever in the Contract Documents any specific article, device, equipment, product, material, fixture, patented process, form method, or type of construction is indicated or specified by name, make, trade name or catalog number, with or without the words "or equal" such specification shall be deemed to be used for the purpose of facilitating description of material, process or article desired and shall be deemed to be followed by the words "or equal." Substitution requests that do not comply with the requirements of this Article may be rejected without review. Products proposed for substitution must equal in all respects to the specified product and have no adverse affect on project cost or schedule. See Section 01 25 00 – Substitution Procedures for requirements.

5.3.2 Substitution proposals will not be considered prior to receiving bids.

5.3.3 SIDE-BY-SIDE COMPARISON. Substitution requests must be in writing and include a comparison of the salient feature and properties of specified product with those of the proposed substitution. If detailing of related or adjacent work must change to accommodate the proposed substitution, those details must be included in the comparison.

5.3.4 AGENCY REVIEW. With the exception of deferred approvals, Products requiring specific approval from a regulatory agency regarding a structural, or other code requirement, may not be proposed for substitution until Contractor has obtained approval from the regulating agency of the Product for the intended use.

5.3.5 CONTRACTOR'S CERTIFICATION. By proposing a substitution the Contractor certifies the following: That Contractor has determined that the proposed substitution is equal or superior in all respects to that specified, including durability and cost of maintenance; that the Contractor will take responsibility for any project delays or increase the costs related to the substitution; and that the Contractor will coordinate the installation of the substitution, if accepted, making such changes as may be required for the Work to be complete in all respects.

5.3.6 NO SUBSTITUTION. The listings of products in the specifications for which no substitution is allowed may be followed by the words "no substitution".

5.3.7 NO KNOWN EQUAL. Substitution requests for Products listed in the specifications, may be followed by the words "no known equal", and will not be considered after bidding unless the specified product has been discontinued, is in conflict with other portions of the Work, or the substitution would result in a credit or otherwise provide a tangible benefit to the Owner. Such request must be made in a timely manner to allow reasonable time for review without causing delay of the Work.

5.3.8 OR APPROVED EQUAL. Substitutions for Products listed in the specifications, may be followed by the words "or equal", or "or approved equal", will be considered within the time frame allowed for the submittal of the specified product, provided reasonable time is allowed for review.

5.4 OPERATION AND MAINTENANCE MANUALS

At completion of project, Contractor shall furnish 3 complete sets of manuals containing the manufacturers' instructions for maintenance and operation of each item of equipment and apparatus furnished under the Contract Documents and any additional data specifically requested under the various Sections of the Specifications. The manuals shall be arranged by section number, consistent with the Project Manual, indexed, and placed in three-ring binders. Prior to submittal of Contractor's Application for Final Payment, and as a further condition to its approval by the Architect the Contractor shall certify that each manual is complete and accurate.

ARTICLE 6 - TESTING AND INSPECTION

6.1 GENERAL

6.1.1 INSPECTOR. The Inspector is the person or persons selected by the Owner to provide special inspections consistent with requirements of Title 24, Part 1 of the California Code of Regulations or a person or persons from the City of Stockton Public Works Department performing inspection as required by that agency.

6.1.2 NOT USED.

6.1.3 TESTING LAB. The Testing Lab is that entity or entities selected by the Owner to perform testing and special inspections required under California Code of Regulations, Title 24. The provisions set forth for Testing Labs apply equally to Geotechnical Engineers providing inspection and testing services. Selection of the materials required to be tested shall be made by the laboratory or the Owner's representative and not by the Contractor.

6.1.4 ACCESS AND INFORMATION. The Inspector shall have free access to any or all parts of the Work at any time. The Contractor shall furnish the Inspector such information as may be necessary to keep the Inspector fully informed regarding progress and manner of work and character of materials. Contractor shall coordinate closely and require its Subcontractor to coordinate closely with inspector to facilitate thorough and complete inspection and testing.

6.1.5 SCHEDULING OF TESTS AND INSPECTIONS. Contractor shall schedule tests and inspection in advance and notify the Inspector at least 7 days prior to scheduled test or inspection that the Inspector may make the necessary arrangements. Contractor shall coordinate timing, location, and provide access for testing and inspection.

6.1.6 PROMPT TESTING AND INSPECTION. Properly scheduled and noticed tests and inspections shall be performed promptly to avoid unreasonable delay in the Work.

6.1.7 ADDITIONAL TESTING OR INSPECTION. If the Inspector, the Architect, the Owner, or public authority having jurisdiction determines that portions of the Work require testing beyond that required in the contract documents, Contractor shall schedule, coordinate, and provide access for the additional testing or inspection.

6.2 NOT USED

6.3 NOT USED

6.4 PAYMENT FOR TESTS AND INSPECTIONS.

Owner shall pay for testing and inspections performed by Inspector and Testing Lab except that the Contractor shall be backcharged for the following testing and inspection:

6.4.1 RETESTING OR RE-INSPECTION. Testing or inspection required due to failure of portions of the Work to comply with requirements established by the Contract Documents.

6.4.2 WORK HOURS. If inspection or testing is performed on Saturdays, Sundays, City holidays, or before or after regular work hours during the week, the Contractor shall reimburse the Owner for all inspection costs incurred during such hours.

6.4.3 REMOTE TESTING OR INSPECTION. Any costs of inspection or testing incurred outside of a 50 mile radius from the Project Site or not located in a contiguous county to the Site, whichever distance is greater.

6.4.4 PREMATURE TESTING. In the event the Contractor requests any test or inspection for the Project and inspection or testing cannot be performed or is delayed.

6.5 UNCOVERING OF WORK

6.5.1 UNCOVERING WORK FOR REQUIRED INSPECTIONS. If a portion of the Work is covered contrary to the Inspector's request, the Owner’s or Architect's request, or to requirements specifically expressed in the Contract Documents, it must, if required in writing by the Owner, be uncovered for the Owner’s, Architect's and Inspector’s observation and the Work replaced without change in the Contract Sum or Time.

ARTICLE 7 - THE ARCHITECT

7.1 GENERAL

7.1.1 DEFINITION. The Architect is the person lawfully licensed to practice architecture or an entity lawfully practicing architecture identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The term "Architect" means the Architect or the Architect's authorized representative, and shall include, where applicable, consultants under the Architect's direction and control.

7.1.2 MODIFICATION OF DUTIES. Duties, responsibilities, and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified, or extended without written consent of the Owner and Architect. Consent shall not be unreasonably withheld.

7.1.3 TERMINATION. In the case of the termination of the Architect, the Owner shall appoint a new Architect. The status of the replacement Architect under the Contract Documents shall be that of the former Architect.

7.2 ARCHITECT'S ADMINISTRATION OF THE CONTRACT

7.2.1 STATUS. The Architect will provide administration of the Contract as described in the Contract Documents and will provide consulting and advise to the Owner during construction, until final payment is due, and from time to time during the warranty period, subject to agreement between Owner and Architect. The Architect will advise and consult with the Owner. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents, unless otherwise modified in writing in accordance with other provisions of The Agreement Between Owner and Architect. The Architect will have the responsibilities and authority established by law, including California Code of Regulations, Title 24, and shall have sole authority to make modifications to the plans and specifications portion of the contract documents.

7.2.2 SITE VISITS. The Architect will visit the Site at intervals necessary in the judgment of the Architect or as otherwise agreed by the Owner and the Architect in writing, to become generally familiar with and to keep the Owner informed about the progress and quality of the portion of the Work Completed and to determine in general, if the Work is being performed in a manner indicating that the Work, when completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on Site inspections to check quality or quantity of the Work. On the basis of its on-site observations, the Architect will keep the Owner informed of the progress of the Work.

7.2.3 NO CONTROL OVER CONSTRUCTION. The Architect shall not have control over, charge of, or be responsible for construction means, methods, techniques, schedules, sequences or procedures, or for safety precautions and programs in connection with the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect shall not have control over or charge of acts or omissions of the Contractor, Subcontractors, their agents or employees, or any other persons or entities performing or supplying portions of the Work.

7.2.4 COMMUNICATIONS. Except as otherwise provided in the Contract Documents or when direct communications are warranted by special circumstances, the Owner and the Contractor shall communicate through the Architect. Where direct communication is necessary between the Owner and the Contractor, the Architect shall be promptly informed, and shall receive copies of all written communications. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and material or equipment

suppliers shall be through the Contractor. Communication by and with separate contractors shall be through the Owner.

7.2.5 PAYMENT APPLICATIONS. Pursuant to Article 11, based on the Architect's observations, the Contractor's Applications for Payment, the Architect will review and make recommendations to the Owner regarding the amounts due the Contractor on the Certificates for Payment.

7.2.6 REJECTION OF WORK. In addition to the rights, duties, and obligations of the Inspector under Article 6, the Architect may reject Work which does not conform to the Contract Documents. When the Architect considers it necessary or advisable in order to achieve the intent of the Contract Documents, the Architect may recommend that the Owner require additional inspection or testing of the Work in accordance with Sub-article 6.5, whether or not such Work is fabricated, installed, or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, material and equipment suppliers, their agents or employees, or other persons performing portions of the Work.

7.2.7 INTERPRETATION. The Architect will interpret the Contract Documents and decide matters concerning performance of the Work under the requirements of the Contract Documents. The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the Contract Documents. Interpretations and decisions of the Architect will be consistent with the intent of and reasonably inferable from the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both the Owner and the Contractor and will not show partiality to either. The Architect will not be liable for the result of interpretations or decisions so rendered in good faith.

7.2.8 RESPONSE TO RFI's. The Architect will respond to RFI's with reasonable promptness, while allowing sufficient time in the Architect's professional judgment, to permit adequate review and evaluation of request. If the Architect's response will take longer than 14 calendar days, the Architect shall so notify the Contractor, with a copy to the Owner, estimating the time that will be required to respond. If the Architect's response to an RFI results in a change in the Work, then such change shall be effected by a written Change Order or Construction Change Directive. RFIs are contractor documents, not instruments of service of the Architect, thus Architect's response to RFI will not be sealed by the Architect.

7.2.9 ARCHITECT'S SUPPLEMENTAL INSTRUCTIONS (ASI). The Architect may from time to time issue supplementary instructions consistent with the Contract Documents to clarify the intent of the contract documents. ASIs are instruments of service of the Architect, thus will be sealed by the Architect.

7.2.10 CHANGES. The Architect will prepare Change Orders and Construction Change Directives and may authorize minor changes in the Work as provided in Article 9. Minor changes may be issue in the form of an ASI.

ARTICLE 8 - CONTRACT TIME AND SCHEDULE

8.1 DEFINITIONS

8.1.1 CONTRACT TIME. Contract Time is the period of time, including approved adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

8.1.2 COMMENCEMENT. The Date of Commencement of the Work is the date established in the Agreement and stipulated in the Notice to Proceed regardless of the actions of the Contractor**.**

8.1.3 DAYS. The term "day" as used in the Contract Documents shall mean working day unless otherwise specifically defined.

8.1.4 FINAL COMPLETION. The date of Final Completion is the date established by the Notice of Completion recorded by the Owner at the County Offices.

8.1.5 SUBSTANTIAL COMPLETION. The Date of Substantial Completion is the date certified by the City in accordance with Sub-article 11.8.

8.1.6 DELAY. For the purposes of time extensions, change orders, and claims, a “delay” is a delay in the completion of the Project beyond the date set for Substantial Completion, or a delay that affects the critical path schedule in a way that cannot be mitigated by use of float or by a reasonable adjustment in the sequence of Work or manpower.

8.2 TIME OF COMPLETION

8.2.1 GENERAL. Attention is directed to the provisions in Section 8-1.05, “Time,” of the Caltrans Specifications and these Special Provisions. Unless otherwise stipulated, the contract for the performance of the Work and the furnishing of materials shall commence not more than ten (10) days from the Notice to Proceed date and shall be diligently prosecuted to Substantial Completion before the expiration of the working days specified in this section from the date of said commencement.

8.2.2 CONSTRUCTION PERIOD. The Contractor shall diligently prosecute the contract Work to Substantial Completion within 280 working days. The days to finish the punch list, provided by the City, are included in the Original Working Days. Should the contractor choose to work on a Saturday, Sunday, or on a City Holiday recognized by the labor unions, the Contractor shall reimburse the City of Stockton the actual cost of engineering, inspection, testing, superintendent, and/or other overhead expenses, which are directly chargeable to the Contract. The approximate cost is $100 per hour. Should such work be undertaken at the request of the City, reimbursement will not be required. Full compensation for conforming to the provisions in this section shall be considered as included in the prices paid for the various contract items of Work involved, and therefore no additional compensation will be allowed.

8.3 CONTRACTOR’S CONSTRUCTION SCHEDULE

8.3.1 GENERAL. The Contractor, within 10 days of being awarded the Contract, shall submit for the Owner's and the Architect's information a Critical Path Method (CPM) schedule for the Work in network format, showing anticipated beginning and ending dates for all critical path activities and the logical connection between and among such activities. The schedule shall provide for the expeditious and practical execution of the Work, and shall comply with this Article 8 and any scheduling requirements of Division 01 – General Requirements of the Specifications.

8.3.2 BREAKDOWN. No item on Contractor’s CPM schedule shall exceed 15 working days in duration, unless approved by the Owner.

8.3.3 LONG LEAD ITEMS. The Contractors and Subcontractors shall investigate and become aware of the amount of time required for the manufacture and delivery of all equipment and materials required to perform the Work under this Contract. Manufacture and delivery of long-lead items shall be shown separately on Schedule.

8.3.4 SUBMITTALS. Schedule shall show preparation, review and approval of Submittals, and Deferred Approvals, consistent scheduling requirements of Paragraph 5.2.2 and Division 1 of the specifications. If allowed review time is exceeded because submittals must be revised and

resubmitted to obtain approval, any delay related to such re-submittal shall be the responsibility of the Contractor.

8.3.5 ANTICIPATED RAIN DAYS FOR PROJECT LOCATION. Anticipated rain days for the Stockton area are based on Western Regional Climate Center Data for Stockton, CA.

8.3.6 TIME EXTENSIONS FOR ADVERSE WEATHER. No time extension will be granted for anticipated rain days. Requests for time extensions for adverse weather must documented by data substantiating that weather conditions were abnormal for the time of year, could not have been reasonably anticipated, and affected work on the critical path.

8.3.7 FAILURE TO PROVIDE SCHEDULE. Failure of the Contractor to provide proper CPM schedules as required by this Article may, at the sole discretion of Owner, constitute grounds to withhold, in whole or in part, progress payments to the Contractor, or to reject without consideration, any claim for a time extension.

8.4 PROGRESS AND COMPLETION

8.4.1 REASONABLE SCHEDULE. Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

8.4.2 NO COMMENCEMENT WITHOUT INSURANCE. The Contractor shall not knowingly, except by agreement or instruction of the Owner, in writing, commence operations on the Site or elsewhere prior to the effective date of insurance required by Article 15 to be furnished by the Contractor. The date of commencement of the Work shall not be changed by the effective date of such insurance.

8.4.3 EXPEDITIOUS COMPLETION. Contractor shall proceed expeditiously with adequate forces and shall achieve Completion within the Contract Time. Contractor shall perform the Work in general accordance with the most recently submitted Schedule.

8.4.4 UPDATES, PROGRESS PAYMENTS. Schedule shall be updated on a monthly basis, and at any significant change in the anticipated schedule of the Work, for review at the next regularly-scheduled site meeting with the Owner. Updated schedule shall be submitted with each application for payment.

8.4.5 FLOAT. Difference between the earliest and latest allowable start or finish times for an activity. Either party responsible for an event or condition which delays the Project shall be entitled to take advantage of any remaining float in the Contractor's CPM Schedule.

8.4.6 THREE-WEEK LOOK-AHEAD SCHEDULE. In addition to the monthly-updated CPM schedule, the Contractor shall prepare three-week look-ahead schedules and submit them to the Owner and Architect at the weekly site meetings. These schedules shall show all anticipated activities for each of the Work days within the 3 weeks immediately after the site meeting.

8.4.7 SCHEDULE CONSULTANT. If Contractor falls more than 2 weeks behind the progression of Work shown on its original schedule, after use of contingency and adjustment for approved time extensions, the Owner may retain a scheduling consultant to prepare a recovery schedule for the Contractor’s consideration, the cost to be deducted from the Contract balance. The Contractor shall cooperate with the scheduling consultant by providing all information requested, but shall not be bound to act in accordance with the schedule.

8.5 EXTENSIONS OF TIME, DELAYS, AND RELATED COSTS

8.5.1 GENERAL. Contractor shall be granted reasonable time extension, by Change Order, for delays caused by Owner only pursuant to in this Sub-article 8.5 and for delays beyond the control of the Contractor only pursuant to Sub-article 8.5. Any costs incurred by the Contractor related to extensions of time shall be borne fully by the contractor except as specified in Sub-article 8.5. Because the Contractor has the right and responsibility to schedule the Work as it sees fit to meet the Contract requirements, and because the Contractor has the opportunity to accelerate or decelerate the pace of the Work, increase or decrease manpower, and change the sequence of the Work at will, any delay shall be assumed to be the Contractor's responsibility unless determined otherwise. The burden of proof shall be borne by the Contractor in establishing that any delay is either outside Contractor's control or caused by others. Such proof of delay must be based on the accepted CPM schedules submitted by the Contractor with complete documentation of the CPM logic and actual time involved, and must show that the delay affects Work on the critical path in a way that cannot be made up by use of available "float" in the schedule, a change in sequence, or a reasonable increase in manpower.

8.5.2 DETERMINATION OF DELAY. Determination of delay and reasonable time extensions shall be made by Architect, pursuant to Paragraph 7.2.7.

8.5.3 EARLY COMPLETION. Owner and Contractor stipulate that the Time for Completion established in the Agreement is a reasonable time within which to perform the Work. Regardless of the cause of a delay, the Contractor shall not pursue any claim against the Owner for damages incurred as a result of Contractor's inability to complete its Work in a shorter period than the Contract Time.

8.5.4 INEXCUSABLE DELAYS. "Inexcusable Delay" means any delay in Substantial Completion of the Work beyond the expiration of the Contract Time caused by the Contractor, its employees, Subcontractors, Sub-subcontractors or material suppliers. An inexcusable delay shall not entitle the Contractor to an extension of Contract Time or an increase in Contract Sum but will subject the Contractor to liquidated damages. Delays that could have been avoided by diligent planning or coordination by the Contractor, including allowing adequate time for submittal review or other response from Architect or Owner or timely notice by the Contractor to the Architect or Owner of potential delays are Inexcusable Delays.

8.5.5 LIQUIDATED DAMAGES. Liquidated damages are those damages which the Owner would suffer in the event of delay in occupancy include providing alternative facilities for staff, disruption of business activities, the inability to provide the expected quality of service, and potential increases in transportation, administrative, and staffing costs. Since it would be difficult to determine the actual value of the damages to the Owner resulting from a delay in occupancy, the Contractor and the Owner agree that the stated liquidated damages represent the parties' reasonable estimate of damages the Owner will incur if the Contractor fails to complete the Work within the time and in the manner provided for by the Contract Documents and that such liquidated damages do not constitute a penalty. Liquidated damages only represent damages pertaining to loss of use. The Owner retains the right to recover other actual and verifiable damages incurred as a result of a delay in Substantial Completion such as additional inspection or consultant costs.

8.5.5.1 Attention is directed to the provisions I Section 8-1.10, "Liquidated Damages," of the Caltrans Specifications and these Special Provisions. **The Contractor shall pay liquidated damages to the City of Stockton in the amount of $13,500 (thirteen thousand, five hundred dollars) per each and every calendar day that the Work, remains incomplete after expiration of the Contract Time.** Full compensation for conforming to the provisions of this section shall be considered as included in the prices paid for the various contract items of work involved, and no additional compensation will be allowed therefore.

8.5.6 COMPENSABLE DELAYS.

8.5.6.1 General. **"Compensable Delay"** means any delay in the Substantial Completion of the Work beyond the expiration of Contract Time caused by wrongful acts or negligence of the Owner or Architect, or direction to suspend the Work, or Changes in the Work due to an act or omission of the Owner or Architect, which is unreasonable under the circumstances involved and not within the contemplation of the Contractor. A time extension will be granted for compensable delays.

8.5.6.2 Cost. If any allowance for Owner caused time extensions has been exhausted, Contractor may make claim for only the following direct onsite costs related to a Compensable Delay: daily cost of superintendent and other supervisory staff on site daily for the duration of the Project and during the delay; costs of leased temporary facilities on Site and necessary to the Work during the delay, based on actual receipts from the time period being claimed; and similar documented onsite costs resulting solely from the delay. All other costs are defined as overhead and are covered in Change Order markups. The direct onsite costs may be marked up a maximum of 15% to cover extended overhead.

8.5.6.3 Partial Responsibility. If the Owner and Contractor both contribute to a delay, a time extension will be granted for the full period of that delay without any change in Contract Sum.

8.5.7 EXCUSABLE DELAYS. "Excusable Delay" means any delay beyond the Substantial Completion of the Work beyond the expiration of Contract Time due to causes beyond the control and without the fault or the negligence of the Contractor or Owner, including: acts of a public enemy; acts of a governmental, utility or other agency having jurisdiction at the site; fire; flood; epidemic; quarantine restriction; freight embargo; strike; unforeseen conditions, or adverse weather of an unusually severe nature. Owner and Contractor agree to waive claims against each other and to bear their own costs related to such delays. In the event of an excusable delay there will be no change in Contract Sum and the Contract Time shall be extended by the documented number of days the Project is actually delayed. See Paragraphs 8.2.5 and 8.2.6 for definition of adverse weather.

8.5.8 CONCURRENT DELAYS

8.5.8.1 If Excusable Delays and/or Compensable Delays occur concurrently, the maximum time extension shall be the number of days from the beginning of the first delay to the end of the delay which ever ends last.

8.5.8.2 If an Inexcusable Delay occurs concurrently with a Compensable Delay or an Excusable Delay, the Contract Time shall be extended by the number of days that the delays are concurrent without any change in Contract Sum for that period.

ARTICLE 9 - CHANGES IN THE WORK

9.1 GENERAL

9.1.1 METHODS OF EXECUTION. Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or Field Order, or order for a Minor Change in the Work, subject to the limitations stated in this Article 9 and elsewhere in the Contract Documents.

9.1.2 AGREEING PARTIES. A Change Order shall be based upon agreement among the Owner, Contractor and Architect; a Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor; a minor change in the Work may be ordered by the Architect alone. Change Orders, Construction Change Directives, and minor changes in the Work can only be prepared and issued by the Architect.

9.1.3 NO CHANGES WITHOUT AUTHORIZATION. There shall be no extra Work or change in the Work, without an executed Change Order, Construction Change Directive, or order by the Owner for a minor change in the Work as herein provided. There shall be no change in the Contract Sum, or the Contract Time without an executed Change Order, or Construction Change Directive. The Contractor shall be responsible for any cost or delay associated with any extra work, or correction thereof, performed outside of the above stated Contract modification process.

9.1.4 PROMPT IMPLEMENTATION. Contractor shall proceed promptly with changes in the Work, unless otherwise provided in the Change Order, Construction Change Directive or order for a minor change in the Work. Changes in the Work shall be performed under applicable provisions of the Contract Documents. Special Provisions and Division 1 of the Specifications apply to all changes.

9.1.5 ACCOUNTING RECORDS. With respect to portions of the Work performed as Change Orders and Construction Change Directives the Contractor shall maintain cost-accounting records satisfactory to the Owner, which shall be available to the Owner on the same terms as any other books and records the Contractor is required to maintain under the Contract Documents.

9.2 MINOR CHANGES

9.2.1 MINOR CHANGES. Owner will have authority to order minor changes in the Work not involving adjustment in the Contract Sum, an extension of the Contract Time, if such change is consistent with the intent of the Contract Documents. Such changes shall be effected by written order and shall be binding on the Owner and the Contractor. The Contractor shall carry out such written orders promptly.

9.3 CHANGE ORDERS

9.3.1 DEFINITION. A Change Orders (CO), also known as a Contract Change Order (CCO), is a written instrument, prepared by the City, and signed by the Owner, the Contractor, and the Architect stating their agreement upon a change in the Work; the amount of the adjustment in the Contract Sum, if any; and the extent of the adjustment in the Contract Time, if any.

9.3.2 DETERMINING COSTS. Methods used in determining adjustments to the Contract Sum may include those listed in Sub-article 9.8

9.3.3 CHANGE ORDERS FINAL. All changes to Contract Sum and Contract Time related to a change in the Work shall be included in the same Change Order. Any time extensions caused by the change in Work shall be included. Any allowable costs or allowable time extensions not included shall be deemed waived.

9.3.4 WHEN EFFECTIVE. Field Orders become effective and are binding when signed by the Owner and the Contractor, with no added cost or time after signed. Change Orders shall become effective when executed by the Owner, the Architect, and the Contractor. Change Orders are subject to approval by the Owner.

9.4 PROPOSED CHANGE ORDER (PCO)

9.4.1 DEFINITION. A Proposed Change Order (PCO) is a written request prepared by the Contractor proposing a change in the Contract Sum or Contract Time. A PCO may be in response to a Change Order Request COR, a claim per Article 8, or a recommendation to improve the quality of the Work or reduce the cost of the Work. Overhead is not chargeable while Owner is waiting for the Contractor to develop a Preliminary Change Order.

9.4.2 SCOPE. A PCO shall contain adequate information to enable Architect to perform a detailed evaluation of any proposed change in Contract Sum, Contract Time, or scope of Work. Costs shall be broken down into labor, material, equipment rental, and overhead and profit. Breakdown and detail shall be consistent with that required in Sub-article 9.9. Time requests must comply with Sub-article 9.7 and Article 8.

9.5 CONSTRUCTION CHANGE DIRECTIVES (CCD)

9.5.1 DEFINITION. A Construction Change Directive (CCD) is a written order prepared by the City and signed by the Owner, directing a change in the Work prior to agreement on adjustment, in the Contract Sum or Contract Time, or both. The Owner may by CCD, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, with the Contract Sum and Contract Time being adjusted accordingly.

9.5.2 USE OF CONSTRUCTION CHANGE DIRECTIVE. A CCD shall be used in the absence of total agreement on the terms of a CO. A CCD may be used to begin construction on a change in the Work before the cost of the change has been determined.

9.5.3 PROMPT IMPLEMENTATION. Upon receipt of a CCD, the Contractor shall promptly proceed with the change in the Work involved and advise the Owner of the Contractor's agreement or disagreement with the method, if any, provided in the CCD for determining the proposed adjustment in the Contract Sum and the Contract Time or the method for determining them.

9.5.4 RECORDED AS CHANGE ORDER. A CCD signed by the Contractor indicates the agreement of the Contractor therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

9.6 ADJUSTMENTS IN CONTRACT TIME

9.6.1 CRITICAL PATH. Time extension will not be allowed unless the Contractor can document that the Work of the Change Order was on the critical path of the project schedule, and was scheduled and performed so as to minimize the impact on the overall schedule.

9.6.2 INCLUSION WITH COSTS. Change Orders for additional cost shall include the change in Contract Time, if any, properly attributable to that change in the Work. The change in Contract Time shall be the number of days increase or decrease in the overall project schedule resulting solely from that change in the Work.

9.6.3 NO RESERVATION ALLOWED. In no event will the Contractor be allowed to reserve its rights to assert a claim for time extension related to a Change Order after approval of that Change Order unless the Owner agrees in writing to allow such reservation.

9.7 ADJUSTMENTS IN CONTRACT SUM

9.7.1 METHODS OF DETERMINING COST. The amount of the increase or decrease in the Contract Sum due to a change in the Work, if any, shall be determined in one or more of the following Methods:

9.7.1.1 Lump Sum. Mutual acceptance of a lump sum itemized and supported by sufficient substantiating data to permit evaluation.

9.7.1.2 Unit Price. Unit prices stated in the Contractor's original bid, the Contract Documents, or subsequently agreed upon between the Owner and the Contractor.

9.7.1.3 Agreed Upon Method. Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee.

9.7.1.4 Time-and-Materials. As provide in Sub-article 9.8.

9.7.2 ALLOWABLE COSTS. Unless otherwise provided in the Contract Documents, costs for the purposes of Change Orders shall be limited to labor, materials, equipment rental, and approved costs, as defined in Sub-article 9.8 plus overhead and profit per Paragraph 9.7.4.

9.7.3 COST RELATED TO TIME EXTENSIONS. If a change in Work results in an increase in Contract Time, the costs of extended Contract Time such as additional temporary facilities rental shall not be included in the Change Order. Costs for extended Contract Time will be reconciled at Project closeout. Any approved costs for extended Contract Time will be deducted from Liquidated Damages due Owner, if any. See Sub-article 8.5 for allowable costs for extension in Contract Time.

9.7.4 OVERHEAD AND PROFIT:

9.7.4.1 Definition. Overhead and profit includes profit and all costs of doing business including off-site office expense, bonds, insurance, Special Provisions, supervision, small tools, and all other expenses not specifically included in labor, material, and equipment rental, and approved other costs, as described in Sub-article 9.8.

9.7.4.2 Limits. Contractor's overhead and profit shall not exceed 15% of the sum of labor, materials, equipment rental, and approved costs for any work performed directly by the Contractor. Contractor's overhead and profit Contractor shall not to exceed 8% of labor, materials, rentals, and overhead and profit of any work performed by a Subcontractor. Subcontractors' overhead and profit shall not exceed 15% of labor, materials, and rentals on Work performed directly by Subcontractor. In the event a change involves the work of Sub-Subcontractors, Subcontractor's total overhead and profit shall not exceed 5% and Sub-subcontractors overhead and profit shall not exceed 10%. No Contractor markup on Subcontractor or other markup is permitted. Overhead is not chargeable while Owner is waiting for the Contractor to develop a Preliminary Change Order. Overhead is limited to a maximum $500 per day and only for additional days the Contractor is working on site.

9.7.4.3 Overhead and Profit on Credits. When both additions and credits are involved in a change, the allowance for overhead and profit shall be based on the net increase, if any, with respect to that change. The amount of credit to the Owner for a deletion or change which results in a net decrease in the Contract Sum shall be actual net cost, without overhead and profit, except as follows: credits on PCOs or CCDs issued in the first 21 days of Contract time shall include overhead and profit of 8% for Contractor and Subcontractors or documented overhead and profit from bid.

9.8 TIME-AND-MATERIALS METHOD

9.8.1 COSTS. Costs shall be determined by documentation of actual costs of labor, material, and equipment plus a percentage for overhead and profit per Paragraph 9.7.4.

9.8.2 LABOR. Labor will be the actual cost for wages paid to each worker for the work performed plus actual payments of payroll taxes, benefits, and other direct payroll burden paid. Payroll records shall be made available for documentation purposes. Labor classifications used shall be appropriate to the Work performed and are subject to approval of the Architect.

9.8.3 MATERIAL. Costs shall include taxes and delivery as documented by invoice. Only material actually incorporated into the Work or used in the performance of the Work will be included in costs. In absence of invoice, competitive market price at time of construction, as determined by Architect, shall be used. Materials used are subject to approval of Architect and or Inspector.

9.8.4 EQUIPMENT RENTAL. Costs shall include fuel and transportation costs as documented by invoice. In the absence of invoice, no payment for rental equipment will be made. No payment will be made for hand tools or small power tools or for power tools or equipment that are required to be on site to perform the original Work of the Contract at the time that the extra work is performed. Use of rental equipment is subject to approval of Inspector. Only rental time actually used and necessary for completion of extra Work, as determined by Inspector, will be included in costs.

9.8.5 APPROVED COSTS. Owner may approve other unusual or unforeseen costs not listed above on a case by case basis.

9.8.6 DAILY REPORTS BY CONTRACTOR:

9.8.6.1 General. At the close of each working day, the Contractor shall submit a daily report to the Inspector, on forms approved by the Owner, listing the following, together supporting documentation:

9.8.6.1.1 Labor. Show names of workers, classifications, and number of hours worked.

9.8.6.1.2 Materials. Describe and list quantities of materials used; provide delivery tags, packing lists or receipts.

9.8.6.1.3 Equipment Rental. Show type of equipment, size, identification number, and hours of operation, including, if applicable, loading and transportation; provide delivery tags or receipts.

9.8.6.1.4 Other Costs. Describe in such detail as the Owner may require.

9.8.6.2 NOT USED.

ARTICLE 10 - CLAIMS AND DISPUTES

10.1 GENERAL

10.1.1 CLAIM. A Claim is a demand or assertion by one of the parties seeking, as a matter of right, adjustment or interpretation of Contract terms, payment of money, extension of time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and the Contractor arising out of or relating to the Contract Documents. Claims must be made by written notice. The responsibility to substantiate Claims shall rest with the party making the Claim.

10.1.2 BACKCHARGE. Backcharging is the process of withholding money otherwise due the Contractor in the amount of an expense or damage to Owner caused by the Contractor. If the amount of expense or damage is greater than the amount otherwise due the Contractor, Owner will invoice Contractor for the difference which shall be due upon resolution of claim.

10.1.3 TIME LIMITS ON CLAIMS. Claims by either party must be made within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later. Claims, by either party, must be made by written notice to both the Architect and the other party. If Contractor performs Work related to a claim prior to written notice of that claim for the cost of such Work, Contractor waives any right to assert such claim, except in the case of an emergency endangering life or property arising under Sub-article 14.4. Claims regarding Contract Sum or Contract Time are void if made after final payment.

10.1.4 CONTINUING CONTRACT PERFORMANCE. Pending final resolution of a Claim including mediation, or litigation, unless otherwise agreed to in writing, the Contractor shall proceed diligently with performance of the Contract, and the Owner shall continue to make any undisputed payments in accordance with the Contract. However, Contractor shall not construct any Work related to the claim, if that construction could increase the amount of the claim, unless required to do so in writing by the Owner.

10.1.5 JUSTIFICATION. If the Contractor believes additional cost or time is involved due to a written interpretation from the Architect, an order by the Owner to stop the Work other than as allowed by Paragraph 2.3.1, a written order for a minor change in the Work issued by the Architect, termination of the Contract by the Owner, the Owner's suspension of the Work, unknown condition, or other reasonable grounds, a claim shall be filed in accordance with the procedure established herein. Claims may be in the form of a PCO.

10.1.6 CLAIMS FOR COST. Claims for construction related cost shall comply with Article 9. Claims for costs related to time extensions shall comply with Paragraph 10.1.7, below.

10.1.7 CLAIMS FOR TIME OR DELAY. Claims for time extensions and related costs shall comply with Article 8 and Article 9. In the case of a continuing delay, only 1 written notice of claim is necessary.

10.1.8 CLAIMS FOR ADVERSE WEATHER. If adverse weather conditions are the basis for a claim for additional time, such claim shall be documented by data substantiating that weather conditions were abnormal for the time of year, could not have been reasonably anticipated, and had an adverse effect on the scheduled construction. The number of rain days that could reasonably be expected will be based on available historical weather data for the project location unless specifically enumerated in the Article 8.

10.1.9 CLAIMS FOR UNFORESEEN CONDITIONS.

10.1.9.1 Consistent with Public Contract Code Section 7104 and Government Code Section 4215, as set forth in subparagraphs 10.1.9.2, and 10.1.9.3, below, if Contractor encounters physical conditions at the Site which are concealed, and which differ materially from those indicated in the Contract Documents or record documents provided by Owner, or are unknown conditions of an unusual nature, or which differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, then the Contactor shall immediately notify the Owner per Sub-article 3.3 before conditions are disturbed. The Owner will promptly investigate such conditions, and per Sub-article 7.2, make a written determination as to whether conditions were unforeseeable and require a change in the Work. If appropriate, Owner will issue a CCD to accommodate or correct the condition. Claims by either party in opposition to such Architect's determination must be made within 10 days after the Owner has given notice of the decision.

10.1.9.2 PUBLIC CONTRACT CODE SECTION 7104. Any public works Contract of a local public entity which involves digging trenches or other excavations that extend deeper than four feet below the surface shall contain a clause which provides the following:

10.1.9.2.1 That the Contractor shall promptly, and before the following conditions are disturbed, notify the local public entity, in writing, of any:

(1) Material that the Contractor believes may be material that is hazardous waste, as defined in Section 25117 of the Health and Safety Code, that is required to be removed to a Class I, Class II, or Class III disposal site in accordance with provisions of existing law.

(2) Subsurface or latent physical conditions at the site differing from those indicated by information about the site made available to bidders prior to the deadline for submitting bids.

(3) Unknown physical conditions at the Site of any unusual nature, different materially from those ordinarily encountered and generally recognized as inherent in Work of the character provided for in the contract.

10.1.9.2.2 That the local public entity shall promptly investigate the conditions, and if it finds that the conditions do materially so differ, or do involve hazardous waste, and cause a decrease or increase in the contractor's cost of, or the time required for, performance of any part of the Work shall issue a Change Order under the procedures described in the Contract.

10.1.9.2.3 That, in the event that a dispute arises between the local public entity and the Contractor whether the conditions materially differ, or involve hazardous waste, or cause a decrease or increase in the Contractor's cost of, or time required for, performance of any part of the Work, the Contractor shall not be excused from any scheduled completion date provided for by the Contract, but shall proceed with all Work to be performed under the Contract. The Contractor shall retain any and all rights provided either by Contract or by law which pertain to the resolution of disputes and protests between the contracting parties.

10.1.9.3 Government Code Section 4215. Government Code Section 4215 provides that the Owner assumes the responsibility for removal, relocation, and protection of utilities on the Site at the time of commencement of construction with respect to any such utility facilities which are not identified in the Drawings and Specification made part of the Contract Documents. The Contractor shall not be assessed for liquidated damages for delay in completion of the Project caused by failure of the Owner to provide for removal or relocation of such utility facilities. Owner shall compensate the Contractor for the costs of locating and repairing damage not due to the failure of the Contractor to exercise reasonable care, removing or relocating such utility facilities, and for equipment necessarily idle during such Work.

10.1.10 CLAIMS FOR COSTS OF ADDITIONAL PROFESSIONAL SERVICES. If at any time prior to final payment, through no fault of its own, the Owner find it necessary to secure additional professional services for any purpose, due to any act or omission of the Contractor, the Contractor shall be Backcharged by the Owner for any costs incurred for any such services. Such Backcharging shall be independent from any other Owner remedies. Additional services shall include, but shall not be limited to, the following:

10.1.10.1 Services made necessary by the default of the Contractor, defects or deficiencies in the Work, or failure of the Contractor to perform according to any provision of the Contract Documents.

10.1.10.2 Services in connection with evaluating untimely requests by the Contractor or substitutions of products, materials, equipment, or evaluating requests for substitutions which require revisions to Drawings, Specifications, or additional documentation, and making subsequent revisions to Drawings, Specifications, and providing other documentation required. This provision will not apply to the situation where the specified item is no longer manufactured or available.

10.1.10.3 Services in connection with evaluating requests for substitution of Subcontractors proposed by the Contractor.

10.1.10.4 Services for evaluating and processing claims submitted by the Contractor in connection with the Work outside the established Change Order process.

10.1.10.5 Services required by the failure of the Contractor to prosecute the Work in a timely manner in compliance within the specified Time of Completion.

10.1.10.6 Services in conjunction with the testing, adjusting, balancing and start-up of equipment other than the normal amount customarily associated for the type of Work involved.

10.1.10.7 Services in conjunction with more than 1 re-review of required submittals of Shop Drawings, Product Data, and Samples.

10.1.10.8 Services for processing an RFI when requested information is clearly shown in the Construction Documents or when an RFI is a request to deviate from the Contract Documents or is related to correcting a construction error.

10.1.10.9 Services in connection with more than 2 inspections for completion.

10.2 AUDITING PROCEDURES

10.2.1 OWNER RIGHT TO AUDIT. Upon written notice to Contractor, the Owner shall have the right to audit all records and documents of any nature whatsoever under the custody or control of the Contractor or Contractor's agents, Subcontractors, or representatives, which relate to the Project, including the bid phase. Contractor shall maintain these records for a period of 3 years after the Notice of Completion is issued and make them available to the Owner, the auditors or other representatives appointed by the Owner.

10.2.2 SUBCONTRACTORS. Contractor shall ensure that all Subcontractors maintain appropriate records relating to the Project. Contractor shall furnish records of any Subcontractors or other agents of Contractor to the Owner upon request. If the Owner requests records relating to a Subcontractor or other agent's involvement in the Project, such requests shall be processed through the Contractor. A Contractor's failure to abide by the provisions of this Article shall be deemed a material breach of the Contract and, upon the Owner’s election, may be considered a default.

10.2.3 NOT USED.

10.3 REVIEW OF CLAIMS BY OWNER

10.3.1 DECISION OF OWNER. Claims, including those alleging an error or omission by the Architect, shall be referred initially to the Owner for action. A decision by the Owner shall be required as a condition precedent to mediation of a claim between the Contractor and the Owner as to all such matters arising prior to the date final payment is due. The decision by the Owner in response to a claim shall not be a condition precedent to mediation in the event: the position of Owner is vacant; the Owner has not received evidence or has failed to render a decision within agreed time limit; the Owner has failed to take action required under Paragraph 10.3.4 within 30 days after the claim is made; 45 days have passed after the Claim has been referred to the Owner; or the Claim relates to a Stop Notice Claim.

10.3.2 OWNER'S REVIEW. The Owner will review claims and take one or more of the following preliminary actions within 14 days of receipt of a claim: request additional supporting data from the claimant; reject the claim in whole or in part, stating reasons for rejection; recommend approval of the claim by the other party; or suggest a compromise. The Owner may also, but is not obligated to, notify the surety, if any, of the nature and amount of the claim.

10.3.3 DOCUMENTATION IF RESOLVED. If a claim has been resolved, the Owner will prepare or obtain appropriate documentation.

10.3.4 OWNER'S WRITTEN DECISION. If a claim has not been resolved after consideration of the foregoing and of other evidence presented by the parties or requested by the Owner or Architect, the Owner will approve or reject Claims by written decision, which shall state the reasons therefor and which shall notify the parties of any change in the Contract Sum or Contract Time or

both. The approval or rejection of a claim by the Owner shall be final and binding on the parties but subject to dispute resolution per Sub-Articles 10.4 and 10.5 below. The Contractor, without delaying the job, shall proceed with all Work to be performed under the Contract consistent with Owner's decision without prejudice to a final determination of the dispute.

10.4 DISPUTE RESOLUTION OF CLAIMS OF $375,000.00 OR LESS

10.4.1 GENERAL. Notwithstanding any other provision herein, claims of $375,000.00 or less shall be resolved pursuant to the alternative dispute resolution procedures set forth in Public Contract Code Section 20104, et seq. "claim" for this purpose means a separate demand by the Contractor for a time extension, payment of money or damages arising from Work done by or on behalf of the Contractor pursuant to the Contract, for which payment is expressly provided, or the Contractor is otherwise entitled to, or an amount the payment of which is disputed by the Owner.

10.4.2 SUBMISSION. The Contractor shall submit its claim of $375,000.00 or less to the Owner in writing, within the time frames established under Paragraph 10.1.3, but no later than before the final payment is made. The Owner shall respond within the time provided by statute. If the Contractor disagrees with the response or the Owner fails to respond within the time permitted, the Contractor shall notify the Owner of the disagreement in writing within 15 days from the date of the response or expiration of the time permitted to respond and demand a meet-and-confer conference as detailed in Sub-article 10.5 below. The Owner shall schedule a meet-and-confer conference within 30 days of the demand. If not resolved at the meet-and-confer conference, then the claim shall be submitted to mediation pursuant to the procedures set forth in Sub-article 10.5 below. If the dispute is not resolved at the mediation, the Contractor may initiate a civil action as set forth in Public Contract Code Section 20104 et seq.

10.4.3 TIME LIMITS NOT EXTENDED. Nothing in Subdivision (a) of Public Contract Code Section 20104.2 shall extend the time limit or supersede the notice requirements provided in this Contract for filing claims by the Contractor.

10.5 DISPUTE RESOLUTION OF CLAIMS IN EXCESS OF $375,000.00

10.5.1 MEET AND CONFER CONFERENCE. Following action by the Owner under Sub-article 10.3, the parties will attempt in good faith to resolve any controversy or claim arising out of or relating to this Agreement promptly by negotiations between senior executives of the parties who have authority to settle the controversy. The party disputing the Architect's action shall give the other party written notice of the dispute. Within 10 days after delivery of said notice, executives of both parties shall meet at a mutually acceptable time and place, and thereafter as often as they reasonably deem necessary, to exchange relevant information and to attempt to resolve the dispute. If the matter has not been resolved within 20 days of the disputing party's notice, or if the party receiving such notice will not meet within 10 days, either party may initiate mediation of the controversy as described below.

10.5.2 MEDIATION. As a condition precedent to the initiation of litigation and subsequent to the fulfillment of the claims procedures established in Paragraph 10.8.1 of this Article, disputes in excess of a total value of $375,000.00 shall first be submitted to mediation pursuant to the procedures set forth herein.

10.5.3 NEGOTIATIONS BEFORE MEDIATION. Negotiations to resolve disputes before mediation is initiated are for settlement purposes only and are not binding.

10.5.4 AUTHORIZATION. In the event of a dispute or issue that cannot be resolved by negotiation, the Owner and the Contractor agree to attempt to resolve the matter by mediation. Said mediation is voluntary, non-binding, and intended to provide an opportunity for the parties to

evaluate each other's cases and arrive at a mutually agreeable solution. These provisions relating to voluntary mediation shall not be construed or interpreted as mandatory arbitration.

10.5.5 INITIATION OF MEDIATION. Either party may initiate mediation by notifying the other party or parties in writing.

10.5.6 REQUEST FOR MEDIATION. A Request for mediation shall contain a brief statement of the nature of the dispute or claim, and the names, addresses, and phone numbers of all parties to the dispute or claim, and those, if any, who will represent them in the mediation.

10.5.7 SELECTION OF MEDIATOR. Within 14 days after execution of the Contract for Construction, the parties will meet-and-confer to select an appropriate mediator agreeable to all parties and 2 alternate mediators, who will serve for the entire project. If the parties cannot agree on a mediator, they hereby agree to accept a mediator appointed by a recognized association such as the American Arbitration Association.

10.5.8 QUALIFICATIONS OF A MEDIATOR. Any mediator selected shall have expertise in the area of the dispute and be knowledgeable in the mediation process. No person shall serve as a mediator in any dispute in which that person has any financial or personal interest in the result of the mediation. Before accepting an appointment, the prospective mediator shall disclose any circumstances likely to create a presumption of bias or prevent a prompt meeting with the parties. Upon receipt of such information, the parties shall meet and confer and decide whether to select another mediator.

10.5.9 VACANCIES. If any mediator shall become unable or unwilling to serve, the First Alternate mediator shall be selected unless the parties agree otherwise.

10.5.10 REPRESENTATION. Any party may be represented by persons of its choice, who shall have full authority to negotiate. The names and addresses of such persons shall be communicated in writing to all parties and to the mediator.

10.5.11 TIME AND PLACE OF MEDIATION. The mediator shall set the time of each mediation session. The mediation shall be held at any convenient location agreeable to the mediator and the parties, as the mediator shall determine. All reasonable efforts will be made by the parties and the mediator to schedule the first session within 30 days after initiation of mediation.

10.5.12 IDENTIFICATION OF MATTERS IN DISPUTE. At least 10 days before the first scheduled mediation session, each party shall provide the mediator a brief memorandum setting forth its position with regard to the issues that need to be resolved. At the discretion of the mediator such memoranda may be mutually exchanged by the parties. At the first session, the parties will be expected to produce all information reasonably required for the mediator to understand the issue presented. The mediator may require each party to supplement such information.

10.5.13 AUTHORITY OF MEDIATOR. The mediator does not have authority to impose a settlement on the parties but will attempt to assist the parties in reaching a satisfactory resolution of their dispute. The mediator is authorized to conduct joint and separate meetings with the parties and to make oral and written recommendations for settlement. Whenever necessary, the mediator may also obtain expert advice concerning technical aspects of the dispute, provided the parties agree and assume the expenses of obtaining such advice. Arrangements for obtaining such advice shall be made by the mediator or the parties, as the mediator shall determine. The mediator is authorized to end the mediation whenever, in the mediator's judgment, further efforts at mediation would not contribute to a resolution of the dispute between the parties.

10.5.14 PRIVACY. Mediation sessions are private. The parties and their representatives may attend mediation sessions. Other persons may attend only with the permission of the parties and with the consent of the mediator.

10.5.15 CONFIDENTIALITY. Confidential information disclosed to a mediator by the parties or by witnesses in the course of the mediation shall not be divulged by the mediator. All records, reports, or other documents received by a mediator while serving as mediator shall be confidential. The mediator shall not be compelled to divulge such records or to testify in regard to the mediation in any adversary proceeding or judicial forum. The parties shall maintain the confidentiality of the mediation and shall not rely on, or introduce as evidence in any arbitration, judicial, or other proceedings: views expressed or suggestions made by the other party with respect to the possible settlement of the dispute; statements made by the other party in the course of the mediation proceedings; proposals made or views expressed by the mediator; and whether the other party had or had not indicated willingness to accept a proposal for settlement made by the mediator.

10.5.16 NO STENOGRAPHIC RECORD. There shall be no stenographic record of the mediation.

10.5.17 TERMINATION OF MEDIATION. The mediation shall be terminated: by the execution of a Settlement Agreement by the parties; by a written declaration of the mediator to the effect that further efforts at mediation are no longer worthwhile; or by a written declaration of a party or parties to the effect that the mediation proceedings are terminated.

10.5.18 EXCLUSION OF LIABILITY. No mediator shall be a necessary party in judicial proceedings related to the mediation. No mediator shall be liable to any party for any act or omission in connection with any mediation conducted hereunder.

10.5.19 INTERPRETATION AND APPLICATION OF THESE MEDIATION PROVISIONS. The mediator shall interpret and apply these mediation provisions insofar as they relate to the mediator's duties and responsibility.

10.5.20 EXPENSES. The expenses of witnesses for each party shall be paid by the party producing the witnesses. All other expenses of the mediation, including, required travel and other expenses of the mediator, the expenses of any witness called by the mediator, and the cost of any proofs or expert advice produced at the direct request of the mediator, shall be borne equally by all parties to the mediation**.**

ARTICLE 11 - PAYMENTS AND COMPLETION

11.1 CONTRACT SUM. The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

11.2 SCHEDULE OF VALUES

11.2.1 SUBMITTAL. Within 10 days of the Date of Commencement, on forms approved by the Architect, Contractor shall submit to the Architect a Schedule of Values allocated to various portions of the Work, broken down in the detail specified in Division 1 of the specifications. Each line item must include all markup and expense and no single line item may exceed 2% of the Contract Sum. Mandatory line items are as follows:

11.2.1.1 Record Drawings: $25,000

11.2.1.2 Warranties and Manuals: $30,000

11.2.2 OWNER REVIEW. The Owner shall review all submissions received pursuant to Paragraph 5.2 and 11.2 in a timely manner. The submitted Schedule of Values, unless objected to by the Architect or Owner, shall be used as a basis for reviewing the Contractor's Applications for Payment**.**

11.3 APPLICATIONS FOR PAYMENT

11.3.1 PROCEDURE. On or before the date established in the Agreement, the Contractor shall submit to the Owner an itemized Application for Payment for operations completed in accordance with the Schedule of Values. Such application shall be supported by the following or such portion thereof as Owner requires**:**

11.3.1.1 The percentage of completion of the Contractor's Work by line item.

11.3.1.2 The additions to and subtractions from the Contract Price and Time.

11.3.1.3 A summary of the retentions (each Application shall provide for retention, as set out in Article 11.6, of the amount due until completion of the Work of the Contractor and Final Acceptance thereof by Owner).

11.3.1.4 A certification that as-built drawings are current.

11.3.1.5 Updated schedules as required in Article 8 above.

11.3.1.6 Contractor’s certification that all required insurance is in full force and effect.

11.3.1.7 The amount paid to the date of the Application to the Contractor, to all its Subcontractors, and all others furnishing labor, material, or equipment for its Contract

11.3.1.8 The amount being requested with the Application for Payment by the Contractor on its own behalf and separately stating the amount requested on behalf of each of the Subcontractors and all others furnishing labor, material, and equipment under the Contract and the balance that will be due to each of such entities after said payment is made.

11.3.1.9 A statement showing all payments made by the Contractor for labor and materials on account of the Work covered in the preceding Application for Payment.

11.3.1.10 A conditional waiver and release upon progress payment from each Subcontractor, covering the Work for the current pay period; and an unconditional waiver and release upon progress payment from each Subcontractor, covering the Work for which payment has been received at least 10 days previous.

11.3.1.11 Material invoices, evidence of equipment purchases, rentals, and other support and details of cost as the Owner may require from time to time.

11.3.2 PAYMENT FOR MATERIALS AND EQUIPMENT. As the Contractor is required to order, obtain, and store materials and equipment sufficiently in advance of its Work at no additional cost or advance payment from Owner, to assure that there will be no delays, payment by the Owner for stored material shall be made only in unusual circumstances where the Architect specifically recommends, and Owner specifically approves, the payment in writing. If payments are to be made on account of materials and equipment not incorporated in the Work, but delivered and suitably stored at the Site or at some other location agreed upon in writing by the Owner, the payments shall be conditioned upon submission by the Contractor, Subcontractor, or vendor of bills of sale and such other documents satisfactory to the Architect and the Owner to establish the Owner's title to such materials or equipment free of all liens and encumbrances, and otherwise protect the Owner's interest, including, without limitation, provision of applicable insurance and transportation to the Site. All stored items shall be inventoried, specified by identification numbers (if applicable), released to the Owner by sureties of the Contractor and the Subcontractor and, if stored off-Site, stored only in a bonded warehouse.

11.3.3 WARRANTY OF TITLE. The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances in favor of the Contractor, Subcontractors, material and equipment suppliers, or other persons or entities making a claim by reason of having provided labor, materials, and equipment relating to the Work.

11.4 CERTIFICATES FOR PAYMENTS

11.4.1 APPROVAL OF APPLICATION FOR PAYMENT. The Architect will, within 7 days after receipt of the Contractor's Application for Payment, either issue to the Owner a Certificate for Payment, with a copy to the Contractor, for such amount as the Architect determines is properly due, or notify the Contractor and Owner in writing of the Architect's reasons for withholding certification in whole or in part as provided in Paragraph 11.5.1.

11.4.2 ARCHITECT'S REVIEW. The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data comprising the Application for Payment, that the Work has progressed to the point indicated and that, to the best of the Architect's knowledge, information and belief, the quality of the Work is in accordance with the Contract Documents. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion and to specific qualifications expressed by the Architect. The issuance of a Certificate for Payment will further constitute a representation that the Contractor is entitled to payment in the amount certified. However, the issuance of a Certificate for Payment will not be a representation that the Architect has made exhaustive or continuous on-site inspections to check the quality or quantity of the Work, reviewed construction means, methods, techniques, sequences or procedures, reviewed copies of requisitions received from Subcontractors and material suppliers and other data requested by the Owner to substantiate the Contractor's right to payment, or made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

11.5 DECISIONS TO WITHHOLD PAYMENT

11.5.1 REASONS TO WITHHOLD PAYMENT. The Owner may decide to withhold payment in whole, or in part, to the extent reasonably necessary to protect the Owner if, in the Owner's opinion, the representations to the Owner required by Paragraph 11.4.2 cannot be made. The Owner may withhold payment, in whole, or in part, to such extent as may be necessary to protect the Owner from loss due to:

11.5.1.1 Defective Work not remedied.

11.5.1.2 Unsatisfactory prosecution of the Work by the Contractor.

11.5.1.3 Failure of the Contractor to prosecute the Work in a timely manner in compliance with established progress schedules and completion dates.

11.5.1.4 Reasonable doubt that the Work can be completed for the unpaid balance of Contract Sum or by the completion date.

11.5.1.5 Failure of the Contractor to submit on a timely basis, proper and sufficient documentation required by the Contract Documents, including, without limitation, monthly progress schedules, Shop Drawings, submittal schedules, Schedule of Values, Product Data and Samples, proposed product lists, executed Change Orders, verified reports, and update of Record Documents.

11.5.1.6 Breach of any provision of the Contract Documents.

11.5.1.7 Third party claims filed or reasonable evidence indicating probable filing of such claims unless security acceptable to the Owner is provided by the Contractor.

11.5.1.8 The cost of professional services retained by the District in accordance with the provisions of Paragraph 10.1.10.

11.5.1.9 Failure to pay Subcontractors or material suppliers.

11.5.1.10 Failure to pay prevailing wages, by the Contractor or any Subcontractor.

11.5.1.11 Stop Notices filed, unless the Contractor at its sole expense provides a bond or other security satisfactory to the Owner in the amount of at least 125% of the claim, in a form satisfactory to the Owner, which protects the Owner against such claims.

11.5.1.12 Liquidated damages assessed against the Contractor.

11.5.1.13 Damage to the Owner, another Contractor, or Subcontractor.

11.5.1.14 Erroneous estimates by the Contractor of the value of the Work performed, or other false statements in an Application for Payment.

11.5.2 REASONS FOR WITHHOLDING PROVIDED. Upon request of the Contractor whose payment is deferred, the Contractor shall be given a written copy of Owner's reasons for withholding payment.

11.5.3 PAYMENT AFTER CURE. When the grounds for declining approval are removed, payment shall be made for amounts withheld because of them. No interest shall be paid on any retainage or amounts withheld due to the failure of the Contractor to perform in accordance with the terms and conditions of the Contract Documents.

11.6 RETAINAGE

11.6.1 GENERAL. Owner will retain 5% of approved payments to ensure performance under the Contract. The retention will be released once the project is completed.

11.6.2 SUBSTITUTION OF SECURITIES. In accordance with Section 22300 of the Public Contract Code, the Owner will permit the substitution of securities for any monies withheld by the Owner to ensure performance under the Contract. At the request and expense of the Contractor, securities equivalent to the amount withheld shall be deposited with the Owner, or with a state or federally chartered bank as the escrow agent, who shall then pay such monies to the Contractor. Upon satisfactory completion of the Contract, the securities shall be returned to the Contractor. Securities eligible for investment under this Paragraph shall include those listed in Government Code Section 16430, bank or savings and loan certificates of deposit, interest-bearing, demand-deposit accounts, standby letters of credit, or any other security mutually agreed to by the Contractor and the Owner. The Contractor shall be the beneficial Owner of any securities substituted for monies withheld and shall receive any interest thereon. The escrow agreement used for the purposes of this paragraph shall be substantially similar to the form set forth in Public Contract Code Section 22300.

11.6.3 PAYMENT OF RETAINAGE.

11.6.3.1 At Final Completion. Pursuant to Public Contract Code Section 7107 the retainage, less any amounts disputed by the Owner or which the Owner has the right to withhold, shall be paid after approval by the Owner of the Architect's Certificate of Payment referred to in Paragraph 11.10.1, and after the satisfaction of the conditions set forth in Sub-article 11.10, and within 60 days after the acceptance of the Work and recording of the Notice of Completion by Owner. No interest shall be paid on any retainage, or on any amounts withheld due to a failure of the Contractor to perform, in accordance with the

terms and conditions of the Contract Documents, except as provided to the contrary in any Escrow Agreement between the Owner and the Contractor pursuant to Public Contract Code Section 22300.

11.7 PROGRESS PAYMENTS

11.7.1 PAYMENTS TO CONTRACTOR. Within 30 days after Owner has received an invoice, Contractor shall be paid a sum equal to 95% of the total certified for payment, less the aggregate of previous payments. The value of the Work completed shall be an estimate only, no inaccuracy or error in said estimate shall operate to release the Contractor, or any bondsman, from damages arising from such Work or from enforcing each and every provision of this Contract, and the Owner shall have the right subsequently to correct any error made in any estimate for payment. Payment will be allowed only for material incorporated into the work, or securely stored onsite. See Division 1 – General Requirements for certain pre-requisites for payment applications, as may apply.

11.7.2 PAYMENTS TO SUBCONTRACTORS. No later than 10 days after receipt, pursuant to Business and Professions Code Section 7108.5, the Contractor shall pay to each Subcontractor, out of the amount paid to the Contractor on account of such Subcontractor's portion of the Work, the amount to which said Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of such Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner. Payment will be allowed only for material incorporated into the work, or securely stored onsite.

11.7.3 PERCENTAGE OF COMPLETION OR PAYMENT INFORMATION. The Owner will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor, and action taken thereon by the Owner, on account of portions of the Work done by such Subcontractor.

11.7.4 NO OBLIGATION OF OWNER FOR SUBCONTRACTOR PAYMENT. The Owner shall have no obligation to pay, or to see to the payment of, money to a Subcontractor except as may otherwise be required by law.

11.7.5 PAYMENT TO SUPPLIERS. Payment to material or equipment suppliers shall be treated in a manner similar to that provided in Paragraphs 11.7.2, 11.7.3 and 11.7.4.

11.7.6 PAYMENT NOT CONSTITUTING APPROVAL OR ACCEPTANCE. An approved Request for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

11.7.7 JOINT CHECKS. Owner shall have the right, if necessary for the protection of the Owner, to issue joint checks made payable to the Contractor and Subcontractors and/or material or equipment suppliers. The joint check payees shall be responsible for the allocation and disbursement of funds included as part of any such joint payment. In no event shall any joint check payment be construed to create any contract between the Owner and a Subcontractor of any tier, any obligation from the Owner to such Subcontractor, or rights in such Subcontractor against the Owner.

11.8 SUBSTANTIAL COMPLETION

11.8.1 DEFINITION: Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

11.8.2 CONTRACTORS NOTICE: When the Contractor considers, in consultation with the Inspector, that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, and the Inspector agrees that the Work is ready for inspection, the Contractor shall so notify the Owner in writing and include comprehensive list of minor items to be completed or corrected (Contractor's List). Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

11.8.3 INSPECTIONS: Upon receipt of the Contractor's list, the Owner and designated Owner's Representative, in the company of the Contractor, will make an inspection to determine whether the Work, or designated portion thereof, is substantially complete. If the Owner's inspection discloses that the Work is not complete enough for efficient documentation of the Punch List, the Contractor will be notified of which items of incomplete Work are preventing a complete inspection. The Contractor shall, before requesting another inspection, complete or correct such items and all items on the Contractors List. The Contractor shall then submit a request for an additional inspection by the Owner and to determine Completion. If the Owner's inspection discloses that the Work is complete enough for efficient documentation of the final Punch List, the Owner and designated Owner's Representative will complete the inspection of the Work.

11.8.4 CERTIFICATE OF SUBSTANTIAL COMPLETION. If the inspection confirms that the Work is substantially complete, the City will prepare a Punch List and a Certificate of Substantial Completion which shall establish the responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, and fix the time within which the Contractor shall finish all items on the Punch List. The Certificate of Substantial Completion shall be submitted to the Owner and the Contractor for their written acceptance of responsibilities assigned to them in such Notice.

11.8.5 COMMENCEMENT OF WARRANTIES. Warranties required by the Contract Documents shall commence on the date of Substantial Completion or acceptance of the item of work in question by the Owner, whichever is later. Warranties are subject to extension per Article 12.

11.8.6 COMPLETION OF PUNCH LIST WORK. Contractor shall, upon receipt of the City's Punch List, immediately initiate work on all items therein and complete the same within the time period allowed, not to exceed 30 days. Upon completion of the Work contained in the Punch List and any other non-conforming work discovered in the process, the Contractor shall notify the Owner and Architect that the Work is ready for final inspection and acceptance and shall submit to the Architect

11.8.7 WORK NOT COMPLETED. Any Work remaining to be completed after date of Substantial Completion shall be completed within 30 days of that date. Owner reserves the right to either obtain quotes from other Contractors to complete any Work, or request the Architect to estimate the costs of construction by another Contractor to complete any Work. At the Owner's discretion, Owner may deduct from the final payment the value of the Work not completed within 30 days of Substantial Completion, based either on quotes from other Contractors or on the Architect's estimate of costs to complete that Work plus a reasonable allowance for architectural, engineering, inspection, and project management services necessary to administer the completion of the Work plus a reasonable allowance for other expenses incurred in completion of the Work..

11.8.8 COSTS OF MULTIPLE INSPECTIONS. More than one request each under Paragraph 11.8.3 or 11.10.1 of the Owner or Architect to make inspections required resulting in Architect visiting Site, shall be considered an additional service of Architect, and all subsequent costs will be invoiced to Contractor and withheld from remaining payments.

11.9 PARTIAL OCCUPANCY OR USE

11.9.1 OWNER'S RIGHTS. The Owner may occupy or use any completed or partially completed portion of the Work at any stage. The Owner and the Contractor shall agree in writing to the responsibilities assigned to each of them for payments, security, maintenance, heat, utilities, damage to the Work, insurance, the period for correction of the Work, reduction in amount per day of liquidated damages, and the commencement of warranties required by the Contract Documents. When the Contractor considers a portion complete, the Contractor shall prepare and submit a Punch List to the Owner as provided under Paragraph 11.8.

11.9.2 INSPECTION PRIOR TO OCCUPANCY OR USE. Immediately prior to such partial occupancy or use, the Owner, the Contractor, and the Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

11.9.3 OCCUPANCY IS NOT ACCEPTANCE. Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of the Work not complying with the requirements of the Contract Documents.

11.10 FINAL COMPLETION AND FINAL PAYMENT

11.10.1 FINAL INSPECTION: Upon receipt of written notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect and Owner will promptly make such inspection and, when the Architect and Owner find the Work acceptable under the Contract Documents and the Contract fully performed, the Architect shall issue a final Certificate of Payment stating that to the best of its knowledge, information, and belief, and on the basis of its observations, inspections, and all other data accumulated or received by the Architect in connection with the Work, such Work has been completed in accordance with the Contract Documents. Upon acceptance of the Work of the Contractor as fully complete the Owner shall record a Notice of Completion with the County Recorder, and the Contractor shall, upon receipt of payment from Owner, pay the amounts due Subcontractors.

11.10.2 FINAL PAYMENT. Final payment shall be contingent on the following:

11.10.2.1 A full and final waiver or release of all Stop Notices in connection with the Work shall be submitted by Contractor, including a release of Stop Notice in recordable form, together with (to the extent permitted by law) a copy of the full and final waiver of all Stop Notices or a Stop Notice Release Bond from a surety acceptable to the Owner as defined by the Contract Documents, including a release of Stop Notice in recordable form, in connection with the Work obtained by Contractor from each person to receive a payment thereunder, which waivers of Stop Notice shall be in a form as approved by Owner.

11.10.2.2 The Contractor shall have made all corrections to the Work which are required to remedy any defects therein, to obtain compliance with the Contract Documents or any requirements of applicable codes and ordinances, or to fulfill any of the orders or directions of Owner required under the Contract.

11.10.2.3 The Contractor shall insure that each Subcontractor shall have delivered to the Contractor all written guarantees, warranties, applications, and bonds required by the Contract Documents for its portion of the Work.

11.10.2.4 The Contractor shall deliver to the Owner final As-Built Redline drawings with the Contractor's certification of their accuracy, all guarantees, operation and maintenance instructions for equipment and apparatus, and other close-out submittals required by the Contract Documents. The documents, except the As-Built Redlines, shall be organized in a three-ring binder pursuant to the Contract Documents.

11.10.2.5 Architect shall have issued a Final Certificate of Payment.

11.10.2.6 The Contractor shall have removed all waste materials and rubbish from and about the Site, as well as all tools, construction equipment, machinery, surplus material, scaffolding equipment, and any other similar materials of the Contractor or any

Subcontractor, shall have cleaned, all glass surfaces, and shall have left the Work broom clean, except as otherwise provided in the Contract Documents.

ARTICLE 12 - WARRANTY AND CORRECTION OF WORK

12.1 WARRANTY OF WORK

The Contractor warrants to the Owner and Architect that material and equipment furnished under the Contract will be of good quality and new unless otherwise required or permitted by the Contract Documents, that the Work will be free from defects not inherent in the quality required or permitted, and that the Work will conform with the requirements of the Contract Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized, may be rejected by the Architect or the Owner. The Contractor's warranty does not cover damage or defect caused by abuse, modifications not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear under normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

12.2 CORRECTION OF WORK

12.2.1 CORRECTION OF REJECTED WORK

The Contractor shall promptly correct Work rejected by the Architect or Owner or Work which does not conform to the requirements of the Contract Documents, whether discovered before or after Substantial Completion and whether or not fabricated, installed, or completed. Costs of correcting such rejected Work, including additional testing and inspections and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

12.2.2 REMOVAL OF NONCONFORMING WORK. The Contractor shall remove from the Site portions of the Work which are not in accordance with the requirements of the Contract Documents and are not corrected by the Contractor or accepted by the Owner.

12.2.3 OWNER'S RIGHTS IF CONTRACTOR FAILS TO CORRECT. If the Contractor fails to correct nonconforming Work within a reasonable time after receiving notice from the Owner, the Owner may correct it in accordance with Paragraph 2.3.2.

12.2.4 COST OF CORRECTING THE WORK. The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner or separate Contractors, whether completed or partially completed, caused by the Contractor's correction or removal of Work which is not in accordance with the requirements of the Contract Documents.

12.3 CORRECTIONS AFTER SUBSTANTIAL COMPLETION

12.3.1 PROMPT NOTIFICATION AND CORRECTION. In addition to the Contractor's obligations under Sub-article 12.1, if within 1 year after the date for commencement of warranties established under Paragraph 11.8.5, or by terms of an applicable guarantee or warranty required by the Contract Documents, any Work is found to be not in accordance with the requirements of the Contract Documents, the Owner shall promptly notify the Contractor of the condition and the Contractor shall correct it promptly, unless the Owner has previously given the Contractor a written acceptance of such condition. If the Contractor fails to correct the nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Paragraph 2.3.2.

12.3.2 EXTENSION OF CORRECTION PERIOD. For Work requiring repair or discovered to not comply with Contract Documents after Substantial Completion, but before final completion, and for Work first performed after Substantial Completion, the 1 year correction period shall be extended by the period of time between Substantial Completion and the actual completion or correction of the Work. This obligation under this Paragraph 12.3.2 shall survive acceptance of the Work under the Contract and termination of the Contract.

12.3.3 NO TIME LIMITATION. Nothing contained in this Sub-article 12.3, or in guarantees or warranties required in the Specifications, shall be construed to establish a period of limitation with respect to other obligations which the Contractor might have under the Contract Documents. Establishment of the time period of 1 year period for correction of Work as described in Paragraph 12.3.1 relates only to the specific obligation of the Contractor to correct the Work and has, for example, no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, or to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

12.4 ACCEPTANCE OF NONCONFORMING WORK

If the Owner prefers to accept Work which is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, if removal and correction are not required to meet Code requirements. If the Owner accepts the nonconforming Work, the Contract Sum shall be reduced an appropriate and equitable amount to be determined by the Architect. Such reduction shall be effective whether or not final payment has been made.

ARTICLE 13 - PROTECTION OF PERSONS AND PROPERTY

13.1 SAFETY PROGRAMS AND PRECAUTIONS

13.1.1 GENERAL. The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the performance of the Contract.

13.1.2 SAFETY PROGRAM. Contractor shall initiate a safety program and designate a responsible member of its organization whose duties shall include loss and accident prevention, and who shall have the responsibility and full authority to enforce the program. This person shall conduct regularly scheduled meetings with the representatives of the various Subcontractors employed to ensure that all employees understand and comply with the program. The safety program, in addition to normal legislative requirements of a safety program, will address the additional requirements to provide for the safety of anyone using the site, to separate the construction area from the remaining property, and to prohibit the use of school facilities by Contractor's employees unless specifically permitted otherwise.

13.1.3 MATERIAL SAFETY DATA SHEETS. The Contractor and each Subcontractor shall supply to their employees, and where site is occupied, to the Owner, copies of Material Safety Data Sheets (MSDS) for hazardous substances that may be used in the course of the Work, together with notice of actual hazardous substances to which employees may be exposed while performing Work and appropriate protective measures.

13.2 SAFETY OF PERSONS AND PROPERTY

13.2.1 RESPONSIBILITY AND PRECAUTIONS. The Contractor shall assume responsibility for and take continuous precautions for the safety of, and shall provide continuous protection to prevent damage, injury, or loss to:

13.2.1.1 Employees on the Work and other persons who may be affected thereby.

13.2.1.2 The Work, material, and equipment to be incorporated therein, whether in storage on or off the Site, under the care, custody, or control of the Contractor or the Contractor's Subcontractors or Sub subcontractors.

13.2.1.3 Other property at the Site or adjacent thereto such as trees, shrubs, lawns, walks, pavement, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

13.2.1.4 Owner's property, and the property of others potentially affected by the execution of the Work.

13.2.1.5 Notwithstanding other provisions in the Contract for Construction, the Contractor will comply with any pandemic (e.g. COVID, other) related orders and practices which may be in effect during construction. The cost of complying with such measures will be included in Contractor's scope and bid price, and will not be an allowed grounds for a cost change.

13.2.2 REMEDY OF LOSS. The Contractor shall remedy any such damage, injury, or loss, except such as may be solely due to, or caused by, agents or employees of the Owner, to the Owner's property, or the property of others arising in connection with operations under the Contract Documents (other than damage or loss insured under property insurance required by the Contract Documents).

13.2.3 NOTICES AND REGULATIONS. The Contractor shall give notices and comply with applicable laws, ordinances, rules, regulations, and lawful orders of public authorities bearing on the safety of persons or property or their protection from damage, injury, or loss.

13.2.4 SAFETY BARRIERS AND SAFEGUARDS. The Contractor shall erect and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations, and notifying owners and users of adjacent Sites and utilities.

13.2.5 STRUCTURAL LOADING AND TEMPORARY CONSTRUCTION. The Contractor shall not impose loading upon any part of the Work under construction or upon existing construction on or adjacent to the Site in excess of safe limits, or loading such as to result in damage to the Work. The design of temporary construction, including, hoisting equipment, cribbing, shoring, barricades, walkways, scaffolding and temporary bracing, is solely the responsibility of the Contractor. All such items shall conform with the requirements of governing codes and all laws, ordinances, rules, regulations, and orders of all authorities having jurisdiction. The Contractor shall obtain permits for, and procure any engineering or other design required for permits or to verify that temporary construction is adequate for the intended use and capable of safely accepting all loads that may be imposed upon them.

13.2.6 USE OF EXPLOSIVES OR OTHER HAZARDOUS METHODS. When use or storage of explosives, other hazardous materials or equipment, or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel. The Contractor shall notify the Owner at least 7 days before any detonation of explosives on site and before storing explosives or hazardous materials on Site. Location of storage shall be coordinated with the Owner and local fire authorities.

13.3 HAZARDOUS MATERIALS

13.3.1 DISCOVERY OF HAZARDOUS MATERIALS. In the event the Contractor encounters or suspects the presence on the Site material reasonably believed to be asbestos, polychlorinated biphenyl (PCB), or any other material defined as being hazardous by Section 25117 of the

California Health and Safety Code, which has not been rendered harmless, the Contractor shall immediately stop Work in the area affected and report the condition to the Owner and the Architect in writing, whether or not such material was generated by the Contractor or the Owner. The Work in the affected area shall not thereafter be resumed, without written agreement of the Owner and the Contractor. The Work in the affected area shall be resumed only in the absence of asbestos, polychlorinated biphenyl (PCB), or other hazardous material, or when it has been rendered harmless.

13.3.2 HAZARDOUS MATERIAL WORK LIMITATIONS. In the event that the presence of hazardous materials is suspected or discovered on the Site, the Owner shall retain a testing laboratory to determine the nature of the material encountered and whether corrective measures or remedial action is required. The Contractor shall not be required to perform, without consent, any Work in the affected area of the Site relating to asbestos, polychlorinated biphenyl (PCB), or other hazardous material, until any known or suspected hazardous material has been removed, or rendered harmless, or determined to be harmless by Owner, as certified by an independent testing laboratory and/or approved by the appropriate government agency.

13.3.3 INDEMNIFICATION BY OWNER FOR HAZARDOUS MATERIAL NOT CAUSED BY CONTRACTOR. In the event the presence of hazardous materials on the Project Site is not caused by the Contractor, Owner shall pay for all costs of testing and remediation, if any, and shall compensate Contractor for any additional costs incurred or Project delay in accordance with the applicable provisions of Article 9 herein. In addition, Owner shall defend, indemnify and hold harmless the Contractor and its agents, officers, directors and employees from and against any and all claims, damages, losses, costs and expenses incurred in connection with or arising out of, or relating to, the performance of the Work in the area affected by the hazardous material.

13.3.4 INDEMNIFICATION BY CONTRACTOR FOR HAZARDOUS MATERIAL CAUSED BY CONTRACTOR. In the event the hazardous materials on the Project Site is caused by the Contractor, the Contractor shall pay for all costs of testing and remediation, if any, and shall compensate the Owner for any additional costs incurred as a result of Contractor's generation of hazardous material on the Project Site. In addition, the Contractor shall defend, indemnify and hold harmless Owner and its agents, officers, and employees from and against any and all claims, damages, losses, costs and expenses incurred in connection with, arising out of, or relating to, the presence of hazardous material on the Project Site.

13.3.5 TERMS OF HAZARDOUS MATERIAL PROVISION. The terms of this Hazardous Material provision shall survive the completion of the Work and/or any termination of this Contract.

13.4 EMERGENCIES

In an emergency affecting the safety of persons or property, the Contractor shall take any action necessary, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Articles 8, 9, and 10.

13.5 TRENCH EXCAVATION

13.5.1 TRENCHES GREATER THAN 5 FEET. Pursuant to Labor Code Section 6705, if the Contract Sum exceeds $25,000.00 and involves the excavation of any trench or trenches 5 feet or more in depth, the Contractor shall, in advance of excavation, submit to the Owner a detailed plan showing the design of shoring for protection from the hazard of caving ground during the excavation of such trench or trenches. Contractor shall have such plan prepared or reviewed and approved by a civil or structural engineer registered in the state of California at the Contractor’s expense.

13.5.2 NO TORT LIABILITY OF OWNER. Pursuant to Labor Code Section 6705, nothing in this Sub-article 14.5 shall impose tort liability upon the Owner or any of its employees.

13.5.3 NO EXCAVATION WITHOUT PERMITS. The Contractor shall not commence any excavation work until it has secured all necessary permits including the required CAL OSHA excavation/shoring permit. Any permits shall be prominently displayed on the Site prior to the commencement of any excavation.

ARTICLE 14 - INSURANCE AND BONDS

14.1 CONTRACTOR'S LIABILITY INSURANCE

14.1.1 ADDITIONAL INSURED ENDORSEMENT REQUIREMENTS. The Contractor shall name, on any policy of insurance required by the Standard Specifications, the Architect as additional insured. Contractor shall require Subcontractors to name the Architect as additional insured. The Additional Insured Endorsement included on all such insurance policies shall state that coverage is afforded the additional insured with respect to claims arising out of operations performed by or on behalf of the insured. If the additional insured has other insurance which is applicable to the loss, such other insurance shall be on an excess or contingent basis. The amount of the insurer's liability shall not be reduced by the existence of such other insurance.

14.2 WAIVER OF SUBROGATION

The Owner, the Architect, and the Contractor each waive (to the extent permitted by law) any right to recover against the other for damages to the Work, any part thereof, or any and all claims arising by reason of any of the foregoing, but only to the extent that such damages and/or claims are covered by property insurance and only to the extent of such coverage (which shall exclude deductible amounts) by insurance actually carried by either the Owner, or any Contractor.

The provisions of this Sub-article 14.2 are intended to restrict each party to recovery against insurance carriers only to the extent of such coverage and waive fully and for the benefit of each, any rights and/or claims which might give rise to a right of subrogation in any insurance carrier. The Owner and the Contractor shall each obtain in all policies of insurance carried by either of them, a waiver by the insurance companies thereunder of all rights of recovery by way of subrogation for any damages or claims covered by the insurance.

ARTICLE 15 - MISCELLANEOUS PROVISIONS OF LAW

15.1 SMOKE-FREE ENVIRONMENT

The Contractor acknowledges that the Owner operates it's facilities as a Smoke-Free Environment. Smoking is prohibited inside the building or within 25 feet of the building, regardless of the building's level of completion or enclosure. The Contractor shall notify all Subcontractors of this provision.

15.2 COMPLIANCE WITH HEALTH ORDER FROM CITY, COUNTY, OR STATE

The Contractor will comply with any pandemic (e.g. COVID, other) related orders and practices which may be in effect during construction. The cost of complying with such measures will be included in Contractors scope and bid price, and will not be an allowed grounds for a cost change.

ARTICLE 16 - TERMINATION OR SUSPENSION OF THE CONTRACT

16.1 TERMINATION BY THE OWNER FOR CAUSE

16.1.1 GROUNDS FOR TERMINATION. The Owner may terminate the Contract if the Contractor:

16.1.1.1 Persistently or repeatedly refuses or fails to supply enough properly skilled workers or proper materials.

16.1.1.2 Fails to make payment to Subcontractors for materials or labor.

16.1.1.3 Persistently disregards laws, ordinances, rules, regulations, or orders of a public authority having jurisdiction.

16.1.1.4 Otherwise is in substantial breach of a provision of the Contract Documents.

16.1.2 NOTIFICATION OF TERMINATION. When any of the above reasons exist, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, written notice of 7 days, terminate the Contract and may, subject to any prior rights of the surety:

16.1.2.1 Take possession of the Site and of all material, equipment, tools, and construction equipment and machinery thereon owned by the Contractor.

16.1.2.2 Accept assignment of subcontracts pursuant to Sub-article 4.4.

16.1.2.3 Complete the Work by whatever reasonable method the Owner may deem expedient.

16.1.3 PAYMENTS WITHHELD. If the Owner terminates the Contract for one of the reasons stated in Paragraph 17.2.1, the Contractor shall not be entitled to receive further payment until the Work is complete.

16.1.4 PAYMENTS UPON COMPLETION. If the unpaid balance of the Contract Sum exceeds costs of completing the Work, including compensation for professional services and expenses made necessary thereby, such excess shall be paid to the Contractor. If such costs exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor, or Owner, as the case may be, shall be certified by the Architect upon application. This payment obligation shall survive completion of the Contract.

16.2 TERMINATION OR SUSPENSION BY THE OWNER FOR CONVENIENCE

16.2.1 SUSPENSION BY OWNER. The Owner may, without cause, order the Contractor in writing to suspend, delay, or interrupt the Work in whole or in part for such period of time as the Owner may determine.

16.2.1.1 Adjustments. An equitable adjustment shall be made for increases in the cost of performance of the Contract, including profit on the increased cost of performance caused by suspension, delay, or interruption. No adjustment shall be made to the extent:

16.2.1.1.1 That performance is, was or would have been so suspended, delayed, or interrupted by another cause for which the Contractor is responsible.

16.2.1.1.2 That an equitable adjustment is made or denied under another provision of this Contract.

16.3 TERMINATION DUE TO DISCOVERY OF UNKNOWN CONDITIONS

The Owner reserves the right to terminate this Contract should the Owner determine not to proceed because of the discovery of any condition described in Sub-article 10.1.9 or Sub-article

14.3. The Contractor shall receive payment for all Work performed to the date of termination in accordance with the provisions of Article 11.

16.4 MUTUAL TERMINATION FOR CONVENIENCE

16.4.1.1 The Contractor and the Owner may mutually agree to terminate this Contract for convenience. The Contractor shall receive payment for all Work performed to the date of termination in accordance with the provisions of Article 11.

END SECTION

SECTION 01 01 00
SUMMARY OF WORK ENVIRONMENTALLY REGULATED MATERIALS ABATEMENT

PART 1 GENERAL

1.01 PRE-BID MEETING AND JOBWALK

A. A. Contractor must attend the Pre-Bid Meeting and Job Walk to bid on any or all portions of the contract.

1.02 PROJECT DESCRIPTION

A. SCOPE OF WORK: The Work includes the abatement of hazardous materials from the following Project: New City Hall Renovations & Relocation Project, 501 and 509 West Weber Avenue, Stockton, California. The scope of work includes abatement and proper disposal as per applicable federal, state and local laws and regulations, of the hazardous materials identified in this document prior to the renovation and/or demolition of the buildings.

1. Work included – Base Bid: The Contractor shall furnish labor, materials, services and insurance specifically covering the handling, transportation of asbestos containing materials (ACM), asbestos containing construction material (ACCM), lead based paint (LBP) and lead containing components, and universal waste materials (UWM) which are specified, shown, or reasonably implied for the following:
   a. The removal and disposal of as non-hazardous asbestos waste as required by applicable regulations, of the following friable and non-friable asbestos containing materials.

Asbestos Containing Materials (ACM)
Building 1: 501 West Weber Avenue, Stockton, California:

Asbestos Containing Material	Location(s)	Est. Quantity (Sq. Ft.)	NESHAP CATEGORY
Penetration Mastic (Black/Gray/ Silver)	Roof Penetrations and Sealants	230 SF	Category 2 Non-Friable

Building 2 - 509 West Weber Avenue, Stockton, California:

Asbestos Containing Material	Location(s)	Est. Quantity (Sq. Ft.)	NESHAP CATEGORY
Penetration Mastic (Black/Gray/ Silver)	Roof Penetrations and Sealants at skylight and HVAC Ducting	250 SF	Category 2 Non-Friable
Mastic (black) under 12" Floor tile White and Gray.	Suite 101 Electric Closet and Suite 104 storage closet	120 SF	Category 1 Non-Friable

2. The lead-based paint stabilization/removal, waste characterization, transportation, treatment as per the United States Resource Conservation and Recovery Act (RCRA) And California EPA Department of Toxic Substances Control regulations if required for waste disposal.

The lead containing materials/components, with approximate quantities requiring abatement or stabilization and their general location(s) are as follows:

a. 501 West Weber Avenue, Stockton, California

Substrate and Component	Location	Color	Condition	Lead Concentration (mg/cm^2)	Approximate Quantity
Metal - Window Washing Bosun Platform Anchor Posts	Roof Along Parapet Wall	Gray	Fair	1.0	31 Posts x 3 SF each
Metal - Fire Alarm Pull Station	Exit Stairs on All Floors	Red	Intact	1.0	20 Pull Stations
Ceramic Tile 4" x 4"	Restroom Walls Floors	Brown	Intact	6.4, 4.9	1,800 Square Feet
Glazed Metal Sink	Restrooms	White	Intact	>9.9	20 Sinks

b. 509 West Weber Avenue, Stockton, California

Substrate and Component	Location	Color	Condition	Lead Concentration (mg/cm^2)	Approximate Quantity
Metal - Sprinkler Pipe Connectors and Elbows	Throughout Building on Fire Sprinkler System	Red	Intact	1.0	350 Connectors
Metal Stair Handrail Base	Fourth Floor Stairs to Fifth Floor	Off-White	Intact	1.0	40 LF
Glazed Metal Sink	Restroom Sinks	White	Intact	>9.9	6 Sinks per Floor
Ceramic Tile 5" x 4" and 4" x 4"	Restroom Wall and Cove Base	Brown	Intact	7.8, 7.1	300 SF per Floor
Metal Fire Hydrant	Exterior South side of Building	Red	Intact	1.0	1 Fire Hydrant

Metal Wet Standpipe	Exterior south side of Building	Red	Intact	>9.9	1 Standpipe
Conc. Lamp Post Base	Parking Area Site Lights	Yellow	Intact	1.0	1 Base
Lamp Posts	Common Courtyard	Green	Intact	1.0	8 Lamp Posts

3. The removal and proper disposal following segregation, characterization and/or waste profiling the universal waste materials listed to an approved landfill as required by the California Environmental Protection Agency, Department of Toxic Substances Control (DTSC), in accordance with Title 22, California Code of Regulations (CCR) Chapter 11, Appendix X and the recovery of refrigerants prior to demolition of the HVAC equipment containing CFCs) and /or (HCFCs) as per the EPA regulations 40 CFR Part 82, Subpart F, under Section 608 of the Clean Air ACT (CAA).
   Universal Waste Materials (UWM)
   a. 501 West Weber Avenue, Stockton, California

Universal Waste Material (UWM)	Location - Estimated Quantities	Hazard
Florescent Tube Lights (4' Length and 2' U Shaped)	1st through 5th Floor – 1,660 tubes	Mercury Vapor and Dust
Florescent Light Ballasts*	1st through 5th Floor – 830 Ballasts	Suspect Polychlorinated Bi Phenyls (PCB) Dielectric and Coolant Fluid
Mercury (Hg) Containing Thermostats	1st Floor – 10 Capsules	Liquid Mercury
Heating Ventilation and Air Conditioning (HVAC) Units	Roof Mounted Packaged HVAC Units - 2 Units	Chlorofluorocarbon's (CFC's)

   b. 509 West Weber Avenue, Stockton, California

Universal Waste Material (UWM)	Location - Estimated Quantities	Hazard
Florescent Tube Lights (4' Length and 2' U Shaped)	Basement through 5th Floor – 1,720 tubes	Mercury Vapor and Dust
Florescent Light Ballasts*	1st through 5th Floor – 860 Ballasts	Suspect Polychlorinated Bi Phenyls (PCB) Dielectric and Coolant Fluid
Mercury (Hg)	1st Floor – 4 Capsules	Liquid Mercury

Containing Thermostats		
Heating Ventilation and Air Conditioning (HVAC) Units	Roof Mounted Packaged HVAC Units - 2 Units	Chlorofluorocarbon's (CFC's)
High Intensity Discharge (HID) Lights	Exterior Parking Lot – 25 Lights	Mercury, Metal Halide and/or Sodium Vapor

* Lighting Ballasts manufactured after 1977 (with a date stamp of 1978 or after) are not suspected to contain PCB oils.

Estimated quantities are provided as an approximate guide to the Contractor. The material quantities listed in the table are approximations and AGE is not responsible for the accuracy of the quantities and measurements provided. The Contractor shall field verify all material quantities, locations, and make themselves cognizant of existing field conditions prior to submitting bids for the work of this specification. Submitting of bids for work described herein shall take into consideration and utilize the Contractor's field measurements of materials and observations of the conditions verified on site.

1.03 EXISTING CONDITIONS

A. Existing conditions are reflected correctly to the best of the Owner's knowledge. Should minor conditions be encountered which are not exactly as indicated, modification to include the new work shall be made as required at no additional expense to Owner.

B. The Owner makes no representation, warranty, or guarantee that the conditions indicated by the test reports either are representative of those conditions existing throughout the area, or that unforeseen developments may not occur, or that materials other than, or in portions different from those indicated may not exist.

C. Contractor is advised that locations of all hazardous materials may not be clearly known and that they shall proceed with caution in all phases of the work. Additional hazardous materials may be uncovered during the course of the work and the Contractor may be directed by the Owner to include this material in the work at an agreed upon price based on the unit prices provided in the bid.

1.04 TESTING BY CONTRACTOR

A. Contractor, at his expense, shall provide all tests and inspections required by applicable regulations such as personnel exposure monitoring, waste characterization testing etc. as required by applicable regulations, codes, standards, Contract Documents (except for that which is exempt), and any other tests and inspections that he deems necessary for his own use.

B. Use of an Environmental Consultant or Observation Service by Owner to conduct specified area and clearance testing does not relieve the Contractor of his responsibility to conduct tests and inspections required by regulations, codes, standards, Contract Documents (except for that which is exempt), and any other tests and inspections for the protection and safety of his employees.

1.05 OBSERVATIONS

Owner's representative Observation Service will observe the status and progress of the work for completeness and general compliance with the requirements of the Contract Documents as well as applicable regulations.

1.06 PHASING

Work will be scheduled as directed by the Owner Architect or Construction Manager. Working hours shall be as required and approved by the Owner. Asbestos LBP abatement activities including, but not limited to, work area preparation, gross removal activities, cleaning activities,

waste removal, etc. must be conducted between 07:00 am to 04:00 pm, Monday through Friday. In addition, multiple mobilizations may be required to perform the work identified in this project. The Contractor shall coordinate and schedule all Work with the Construction Manager and Owner's representative.

1.07 UTILITIES

Utilities will be provided by the owner for this project. The Contractor shall provide supplementary power, emergency power and water necessary to perform the abatement activities.

Provide a weatherproof, grounded temporary electric power service and distribution system of sufficient size, capacity and power characteristics to accommodate performance of work during the construction period.

1.08 TEMPORARY LIGHTING

Lighting for the Work Area and decontamination facilities is to be provided from a temporary electrical panel described below.

Provide the following or equivalent where natural lighting does not meet the required light level:

One 200-watt incandescent lamp per 1000 square feet of floor area, uniformly distributed, for general construction lighting, or equivalent illumination of a similar nature. Provide sufficient temporary lighting to ensure proper workmanship everywhere; by combined use of daylight, general lighting, and portable plug-in task lighting. Provide lighting in areas where work is being performed to supply a 100-foot candle minimum light level. Provide lighting in any area being subjected to a visual inspection to supply a 100-foot candle minimum light level. Provide lighting in the Decontamination Unit to supply a fifty (50) foot candle minimum light level. Provide sufficient lighting circuits as required by the work. All lighting circuits are to originate at temporary electrical panel.

Circuit Protection: Protect each circuit with a ground fault circuit interrupter (GFCI) of proper size located in the temporary panel.

1.09 WATER SUPPLY

A. The Contractor will provide and pay for water only as necessary for execution of Contractor's work.

B. Water Hoses: Employ heavy-duty abrasion-resistant hoses with a pressure rating greater than the maximum pressure of the water distribution system to provide water into each work area and to each Decontamination Unit.

C. Contractor(s) to be responsible for any problems or damage caused by its use of water during the abatement activities.

D. All water supply sources shall be double checked at the end of each shift to ensure shut off valves are completely closed and are water-tight

E. Temporary Water Service Connection: All connections to the Owner's water system shall include backflow protection. Valves shall be temperature and pressure rated for operation of the temperatures and pressures encountered. After completion of use, connections and fittings shall be removed without damage or alteration to existing water piping and equipment. Leaking or dripping valves shall be piped to the nearest drain or located over an existing sink or grade where water will not damage existing finishes or equipment.

1.10 CONTRACTOR USE OF PROJECT SITE

A. The Contractor's use of the project site shall be limited to its construction operations, including on site storage of materials and equipment, on site fabrication facilities, and field offices.

B. Staging and storage of materials on site by Contractor shall primarily be permitted in the areas approved in writing and scheduled in advance by the Owner or Owner's representative.

C. Contractor shall be responsible for the protection of its own work and materials during construction and until completion of the scope of work, and protection of its own material during delivery, unloading, hoisting, while in storage, until accepted by the Owner.

D. Contractor shall be responsible for all safeguards necessary for fire protection and prevention. Fire extinguishers shall be maintained in working order by Contractor throughout the areas of its operations on site, and in particular, Contractor shall ensure that fire extinguishers are located immediately adjacent to all potentially flammable materials and equipment utilized during the performance of the Contractor's work.

E. Contractor shall deliver materials to the jobsite in order to provide for the proper execution of the Work in a continuous, uninterrupted fashion unless scheduled otherwise by the Resident Project Representative. Material deliveries shall be scheduled in coordination with the Resident Project Representative and other Contractors.

1.11 SECURITY AND SAFETY

A. The contractor is responsible for security of their own equipment and tools used to complete this project. Contractor is responsible for worker safety and following all applicable Cal/OSHA requirements.

B. At a minimum, a daily tailgate safety meeting shall be held by the contractor's supervisor at the start of each workday. Additional safety meetings may be required if there is a change in the job hazards. Copies of safety meeting agenda, including a signed list of workers that attended, shall be provided to the Owner's Project Manager.

1.12 OWNER RULES

The Contractor shall abide by all health and safety, security rules and regulations set forth by the Owner and must be followed at all times when on site. Any conflicts with the Owner or Construction Manager must be resolved to the satisfaction of the Owner.

END OF SECTION 01 01 00

SECTION 01 10 00
SUMMARY

PART 1 GENERAL

1.01 PROJECT

A. Project Name: New City Hall Renovations & Relocation Project.

B. Owner's Name: City of Stockton.

C. Architect's Name: Indigo Hammond + Playle Architects, LLP.

D. The Project consists of the alteration, new constructon, and remodel of new City of Stockton offices at the exisiting Waterfront Towers located at 501 & 509 West Weber Avenue, Stockton, CA 95203 including site improvements.

1.02 CONTRACT DESCRIPTION

A. Contract Type: A single prime contract based on a Stipulated Price as described by Division 00 - Procurement and Contracting Requirements generally, and by the Sample Construction Contract specifically.

1.03 DESCRIPTION OF ALTERATIONS WORK

A. Scope of demolition and removal work is indicated on drawings and specified in Section 02 41 00 and Section 02 41 13. Other Division 02 - Existing Conditions sections as applies.

B. Scope of alterations work is indicated on drawings and includes both renovation of existing construction and new construction.

C. Additional scope of demolition, removal, and alternations work includes that as may be described at mandatory pre-bid site walk(s). Items not identified as Owner salvage are to be demolished and removed by Contractor.

D. Hazardous material abatement work is included.

E. Commissioining of the work upon completion is includ

F. Renovate the following areas, complete including operational mechanical and electrical work and finishes:
   1. All site work required.
   2. All of Building 1 at 501 West Weber Avenue.
   3. All of Building 2 at 509 West Weber Avenue.

G. Plumbing: Alter existing and add new construction.

H. HVAC: Alter existing and add new construction.

I. Electrical Power and Lighting: Replace existing system with new construction.

J. Fire Suppression Sprinklers: Alter existing and add new construction.

K. Fire Alarm: Replace existing system with new construction.

L. Telephone and IT Data Communications: Replace existing system with new construction.

M. Security System: Add new constructon..

N. Audio/ Visual System: Add new construction.

O. Structural System: Alter existing and add new construction.

P. Temporary Facilities: Provide required temporary facilities, utilities, and services.

Q. Delivery Services: contact USPS postmaster and UPS regarding the drop boxes at the southwest corner of Bldg. No. 1. The concrete is removed and replaced by this project, requiring Contractor to remove drop boxes and reinstall after construction

1.04 FUTURE WORK

A. Project is designed for future building addition to the west of Building 2.

B. Provide utility exclusion zone as shown on the drawings for future installation of new construction.

1.05 OWNER OCCUPANCY

A. City intends to continue to occupy the Property Storage portion of the basement in existing Building 2 during the entire construction period. This area will require 24/7 access by City staff.

B. City intends to occupy the Project upon Substantial Completion.

C. Cooperate with City to minimize conflict and to facilitate City's operations.

D. Schedule the Work to accommodate City occupancy.

1.06 CONTRACTOR USE OF SITE AND PREMISES

A. Provide access to and from site as required by law and by City:
   1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
   2. Do not obstruct roadways, sidewalks, or other public ways without permit.

B. Contractor may not use any existing elevators for transport of material or personnel.

1.07 SPECIFICATION SECTIONS APPLICABLE TO ALL CONTRACTS

A. Unless otherwise noted, all provisions of the sections listed below apply to all contracts. Specific items of work listed under individual contract descriptions constitute exceptions.

END OF SECTION 01 10 00

SECTION 01 21 00
ALLOWANCES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cash allowances.

B. Payment and modification procedures relating to allowances.

C. Allowances are included in on the Bid Form, are included in Contractor's bid and are part of the awarded Contract Sum.

D. Allowances are not additional or changed work, and are not Change Orders.

1.02 RELATED REQUIREMENTS

A. Standard Specifications and Section - 00 72 13 Special Provisions: Additional payment and modification procedures.

B. Section 01 22 00 Unit Prices: pricing for unit quantities.

C. Section 01 23 00 Alternates: relationship to alternates.

1.03 CASH ALLOWANCES

A. Costs Included in Cash Allowances: Cost of complete installation of each allowance item including all subcontractor cost, Contractor's own cost, taxes, delivery, services related to the selection and specification of each item, and inclusive of all markups.

B. Architect Responsibilities:
   1. Consult with Contractor for consideration and selection of products, suppliers , and installers.
   2. Select products in consultation with City and transmit decision to Contractor.

C. Contractor Responsibilities:
   1. Assist Architect in selection of products, suppliers, and installers.
   2. Obtain proposals from suppliers and installers and offer recommendations.
   3. On notification of which products have been selected, execute purchase agreement with designated supplier and installer.
   4. Arrange for and process shop drawings, product data, and samples. Arrange for delivery.
   5. Promptly inspect products upon delivery for completeness, damage, and defects. Submit claims for transportation damage.

1.04 ALLOWANCES SCHEDULE

A. **Allowance No. 1 - Applied Fire Protection, $40,000:**
   1. Section 07 81 00 - Applied Fire Protection: Include in the Total Base Bid Price the stipulated sum of $40,000.00 for identifying existing unprotected locations which require fire protection, purchase, delivery, and installation of all work related to the use of applied fire protection to provide minimum 1-hour fire resistance to existing unprotected portions of the existing structural frame.
      a. Survey and inventory of existing unprotected locations which require fire protection.
      b. Primary structural frame: required 1 hour fire rating.
      c. Roof and floor assemblies: required 1 hour rating.
      d. Prepare existing surfaces and install applied fire protection at these locations, providing continuous 1-hour fire resistance to the existing structural frame and elements.
   2. Relationship of this allowance to other Applied Fire Protection related work included in the Basic Scope of Work and Base Bid Price.
      a. Excluded from this allowance, but otherwise required and included in the Basic Scope of Work and included in the Total Base Bid Price.
         1) Applied Fire Protection Work at all <u>new</u> structural steel which is installed as part of this project, including new steel beams, columns, connections, and

appurtenances. This allowance includes only existing unprotected locations as described above.

B. **Allowance No. 2 - Scanning of Existing Post-tensioned Slabs, $230,000:**
   1. Section 02 41 00 - Demolition: Include in the Total Base Bid Price the stipulated sum of $230,000.00 for identifying and avoiding existing post-tensioning cables and other existing reinforcement in the existing post-tensioned reinforced concrete floor and roof slabs where necessary for the penetration of new piping and conduits, also for the installation of new anchorage devices for support of utilities, metal stud wall, soffit framing, steel framing, etc.
      a. Contractor is required to identify existing openings in the existing post-tensioned reinforced concrete slab and demonstrate Contractor's maximum use of them in order to avoid unnecessary scanning and coring required for new openings.
      b. Contractor is required to identify existing points of support on underside of existing post-tensioned reinforced concrete slab and demonstrate Contractor's maximum use of them in order to avoid unnecessary scanning required for any new supports.
      c. Scanning is defined to include any non-destructive testing measures required, including but not limited to ground penetrating radar scanning and x-ray scanning.
      d. Scanning is included in this allowance, however all coring and all installation of points of support are included in the base bid scope.
      e. Refer to structural drawings for additional requirements, and any requirements found in individual specification sections.
   2. Relationship of this allowance to other Scanning of Existing Post-tensioned Slabs related work included in the Basic Scope of Work and Base Bid Price.
      a. Excluded from this allowance, but otherwise required and included in the Basic Scope of Work and included in the Total Base Bid Price.
         1) All coring and all installation of points of support otherwise required for a complete installation. This allowance includes only the scanning and layout work required to ensure the coring and points of support avoid existing slab reinforcement.

C. **Allowance No. 3 - Additional Site Grading, $170,000:**
   1. Section 31 21 13 Site Grading: Include in the Total Base Bid Price the stipulated sum of $170,000.00 for site grading consisting of overexcavation of existing and replacement with engineered fill in the amount of 2,000 cubic yards CY of placed and compacted fill. This is the additional amount of placed fill which may be required pending the outcome of proof rolling the affected areas and as determined by the geotechnical engineer. All work to be completed in strict compliance with the geotechnical report. Work includes but is not limited to the following.
      a. Overexcavation of existing soils where indicated by proof rolling and as directed by geotechnical engineer.
      b. Hauling and disposal of existing soils, spoils.
      c. Hauling and import of new engineered fill.
      d. Placement and compaction of new engineered fill.
      e. All in accordance with geotechnical report.
   2. Payment for this work, will be per the Unit Price for each cubic yard CY of placed fill of placed fill, verified by truck hauler tickets, and confirmed by City. For more information refer to section 01 22 00 Unit Prices and section 00 72 13 - Special Provisions.
   3. Relationship of this allowance to other Site Work included in the Basic Scope of Work and Base Bid Price.
      a. Excluded from this allowance, but otherwise required and included in the Basic Scope of Work and included in the Total Base Bid Price is the following related Site Grading.
         1) Proof rolling of site area as required.
         2) All other earthwork which may be required by the combined effect of the plans, specifications, and geotechnical report, including but not limited to overexcavation, disposal, import and placement of engineered fill. Exception:

does not include overexcavation, disposal, import and placement of engineered fill which which may be required as an outcome of proof rolling the affected areas as determined by the geotechnical engineer.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 01 21 00

SECTION 01 22 00
UNIT PRICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. List of unit prices, for use in preparing Bids.

B. Measurement and payment criteria applicable to Work performed under a unit price payment method.

1.02 RELATED REQUIREMENTS

A. Section 00 72 13 - Special Provisions: Payments and completion.

B. Section 01 21 00 Allowances: relationship to allowances.

1.03 COSTS INCLUDED

A. Unit Prices included on the Bid Form shall include full compensation for all required labor, products, tools, equipment, plant, transportation, services and incidentals; erection, application or installation of an item of the Work; overhead and profit and all markup of the subcontractors and the general contractor.

1.04 UNIT QUANTITIES SPECIFIED

A. Quantities indicated in the individual specification sections are for bidding and contract purposes only and are included in the basic scope bid. This Unit Prices section applies only to any quantities beyond the amount specified in the individual specification sectionis. Quantities and measurements of actual Work will determine the payment amount.

1.05 MEASUREMENT OF QUANTITIES

A. Measurement methods delineated in the individual specification sections complement the criteria of this section. In the event of conflict, the requirements of the individual specification section govern.

B. Take all measurements and compute quantities. Measurements and quantities will be verified by City.

C. Assist by providing necessary equipment, workers, and survey personnel as required.

D. Measurement by Area: Measured by square dimension using mean length and width or radius.

1.06 PAYMENT

A. Payment for Work governed by unit prices will be made on the basis of the actual measurements and quantities of Work that is incorporated in or made necessary by the Work and accepted by the Architect, multiplied by the unit price.

B. Payment will not be made for any of the following:
   1. Products wasted or disposed of in a manner that is not acceptable.
   2. Products determined as unacceptable before or after placement.
   3. Products not completely unloaded from the transporting vehicle.
   4. Products placed beyond the lines and levels of the required Work.
   5. Products remaining on hand after completion of the Work.
   6. Loading, hauling, and disposing of rejected Products.

1.07 SCHEDULE OF UNIT PRICES

A. **Unit Price No. 1 - EIFS Patch and Repair**: This item is each square foot for EIFS patch and repair beyond the area quantity identified in following sections as part of basic scope; see Section 07 24 01 - Repairs to Existing Insulation and Finish System, inclusive of work required in Section 07 11 00 - Elastomeric Wall Coating.

B. **Unit Price No. 2 - Imported Engineered Fill:** Over-excavation, hauling and disposal; hauling and import of engineered fill; placement and compaction of engineered fill; all in accordance with geotechnical report; and per compacted cubic yard CY of fill. See Section 31 21 13 Site

Grading and refer to geotechnical report.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 01 22 00

SECTION 01 23 00
ALTERNATES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Description of Alternates.

B. Procedures for pricing Alternates.

C. Documentation of changes to Contract Price and Contract Time.

1.02 RELATED REQUIREMENTS

A. Instructions to Bidders: Information on award of bid as relates to acceptance of Alternates.

B. Bid Form: Information how to insert Alternate amounts on Bid Form.

C. Standard Specifications and Section - 00 72 13 Special Provisions: Additional payment and modification procedures.

1.03 ACCEPTANCE OF ALTERNATES

A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at City's option. Accepted Alternates will be identified in the Construction Contract between the City and the Contractor.

B. Coordinate related work and modify surrounding work to integrate the Work of each Alternate.

1.04 SCHEDULE OF ALTERNATES

A. Costs Included in Alternates: Cost of complete installation of each alternate item including all subcontractor cost, Contractor's own cost, taxes, delivery, services related to the selection and specification of each item, and inclusive of all markups. Work excluded from the alternates is work described in the Base Bid.

B. Base Bid: The Base Bid scope of work includes all site work and all work at Building 1 and Building 2 required by the contract documents, excluding the alternate item descriptions for each Alternate below. Each Alternate Item is in addition to the Base Bid Item and is mutually exclusive with the Base Bid scope of work and with one another. Together, the Base Bid scope of work and the Alternates form the scope of work for the complete project. Any work required by the drawings and specifications not listed below or shown on the plans and specifications as part of any Alternate is included in the Basic Bid scope of work.

C. **ALTERNATE NO. 1 - ADD EXTERIOR BUILDING ENVELOPE IMPROVEMENTS:**

1. Work included in this Alternate: This alternate work includes improvements to the existing exterior walls, curtain walls, and windows of Building 1 and Building 2 for complete envelope repair, waterproofing, and sealant work in shown on plans and in specifications including but not limited to repair, replacement, and refinishing of: the existing exterior insulation and finishing system EIFS; curtain wall glazing and joints; and miscellaneous aluminum storefront glazing and joints. See box notes on plans and sheet A-591 for details related to this work. Coating No. 1 will be used on all EIFS surfaces existing and repaired, as indicated in the specifications. Only the additional cost of Coating No. 1 as compared to the cost of Base Bid Coating No. 2 will be allowed.
   a. Exception: Work excluded from this Alternate is described as that Work included in the Base Bid below.
2. This work is to be completed within the contract time stated in the bid documents. No additional contract time is allowed for completion of this alternate.
3. Work included in Base Bid: Any exterior wall and window improvements to Building 1 and Building 2 which are not included in the Alternate Item description above. The Base Bid scope of work includes but is not limited to these related items: installation of a new sheet metal cap parapet coping at the entire roof perimeter of each building; improvements to the glass and steel arcade canopy; storefront replacement at the first floor; removal and replacement of curtain wall glazing required for construction elevator, trash chutes,

equipment access; and patch and repair of all exterior insulation and finishing system EIFS. The work included in the Base Bid also includes preparation and recoating of all EIFS surfaces existing and repaired, using Coating No. 2 in the specifications.

D. **ALTERNATE NO. 2 - ADD EMERGENCY RESPONDER RADIO COMMUNICATION SYSTEM ERRCS IMPROVEMENTS:**

1. Work included in this Alternate: This alternate work includes Emergency Responder Radio Communication System ERRCS complete improvements to floor levels 1 through 5 in Building 1 and floor levels 1 through 5 of Building 2. The term ERRCS is synonymous with distributed antenna system DAS which may be used in some locations on the plans or in the specifications. See box notes on plans for more details related to this work. See Base Bid Item description above for specific items which are included in the Base Bid scope of work, and therefore are excluded from this Alternate.
   a. Exception: Work excluded from this Alternate is described as that Work included in the Base Bid below.
2. This work is to be completed within the contract time stated in the bid documents. No additional contract time is allowed for completion of this alternate.
3. Work included in Base Bid: The base bid includes Emergency Responder Radio Communication System ERRCS improvements in the Basement level of Building 2 only, and ERRCS signal strength test and reporting for each floor of both Bulding 1 and Building 2 at the end of construction. The term ERRCS is synonymous with distributed antenna system DAS which may be used in some locations on the plans or in the specifications.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 01 23 00

SECTION 01 25 00
SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedural requirements for proposed substitutions.

1.02 RELATED REQUIREMENTS

A. Instructions to Bidders: Prohibition of substitution requests prior to award.

B. Standard Specifications and Section - 00 72 13 Special Provisions: Additional requirements related to substitution requests.

C. Section 01 21 00 - Allowances, for cash allowances affecting this section.

D. Section 01 23 00 - Alternates, for product alternatives affecting this section.

E. Section 01 30 00 - Administrative Requirements: Submittal procedures, coordination.

F. Section 01 60 00 - Product Requirements: Fundamental product requirements, product options, delivery, storage, and handling.

G. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions: Restrictions on emissions of indoor substitute products.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
   1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
   2. Agrees to provide the same warranty for the substitution as for the specified product.
   3. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to City.
   4. Waives claims for additional costs or time extension that may subsequently become apparent.

B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.

C. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
   1. No specific form is required. Contractor's Substitution Request documentation must include the following:
      a. Project Information:
         1) Official project name and number, and any additional required identifiers established in Contract Documents.
         2) City's, Architect's, and Contractor's names.
      b. Substitution Request Information:
         1) Discrete and consecutive Substitution Request number, and descriptive subject/title.
         2) Indication of whether the substitution is for cause or convenience.
         3) Issue date.
         4) Reference to particular Contract Document(s) specification section number, title, and article/paragraph(s).
         5) Description of Substitution.
         6) Reason why the specified item cannot be provided.
         7) Differences between proposed substitution and specified item.

8) Description of how proposed substitution affects other parts of work.

c. Attached Comparative Data: Provide point-by-point, side-by-side comparison addressing essential attributes specified, as appropriate and relevant for the item:
   1) Physical characteristics.
   2) In-service performance.
   3) Expected durability.
   4) Visual effect.
   5) Sustainable design features.
   6) Warranties.
   7) Other salient features and requirements.
   8) Include, as appropriate or requested, the following types of documentation:
      (a) Product Data:
      (b) Samples.
      (c) Certificates, test, reports or similar qualification data.
      (d) Drawings, when required to show impact on adjacent construction elements.

d. Impact of Substitution:
   1) Savings to City for accepting substitution.
   2) Change to Contract Time due to accepting substitution.

D. Limit each request to a single proposed substitution item.
   1. Submit an electronic document, combining the request form with supporting data into single document.

3.02 SUBSTITUTION PROCEDURES DURING BIDDING/ PROCUREMENT

A. Not permitted.

3.03 SUBSTITUTION PROCEDURES DURING CONSTRUCTION

A. Architect will consider requests for substitutions only within 60 days after date of Agreement.

B. Submit request for Substitution for Cause within 14 days of discovery of need for substitution, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.

C. Submit request for Substitution for Convenience immediately upon discovery of its potential advantage to the project, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.
   1. In addition to meeting general documentation requirements, document how the requested substitution benefits the City through cost savings, time savings, greater energy conservation, or in other specific ways.
   2. Document means of coordinating of substitution item with other portions of the work, including work by affected subcontractors.
   3. Bear the costs engendered by proposed substitution of:
      a. City's compensation to the Architect for any required redesign, time spent processing and evaluating the request.

D. Substitutions will not be considered under one or more of the following circumstances:
   1. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval.
   2. Without a separate written request.
   3. When acceptance will require revisions to Contract Documents.

3.04 RESOLUTION

A. Architect may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.

B. Architect will notify Contractor in writing of decision to accept or reject request.

1. Architect's decision following review of proposed substitution will be noted on the submitted form.

3.05 ACCEPTANCE

3.06 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

B. Include completed Substitution Request Forms as part of the Project record. Include both approved and rejected Requests.

END OF SECTION 01 25 00

This page intentionally left blank

SECTION 01 30 00
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General administrative requirements.
B. Electronic document submittal service.
C. Preconstruction meetings.
D. Site mobilization meeting.
E. Progress meetings.
F. Construction progress schedule.
G. Contractor's daily reports.
H. Progress photographs.
I. Coordination drawings.
J. Submittals for review, information, and project closeout.
K. Submittal Schedule, aka Schedule of Submittals.
L. Number of copies of submittals.
M. Requests for Interpretation (RFI) procedures.
N. Submittal procedures.

1.02 RELATED REQUIREMENTS

A. Standard Specifications and Section - 00 72 13 Special Provisions: Additional requirements related to administrative requirements and procedures.
B. Section 01 60 00 - Product Requirements: General product requirements.
C. Section 01 70 00 - Execution and Closeout Requirements: Additional coordination requirements.
D. Section 01 78 00 - Closeout Submittals: Project record documents; operation and maintenance data; warranties and bonds.
E. Section 01 91 13 - General Commissioning Requirements: Additional procedures for submittals relating to commissioning.

1.03 REFERENCE STANDARDS

A. AIA G716 - Request for Information 2004.
B. AIA G810 - Transmittal Letter 2001.

1.04 GENERAL ADMINISTRATIVE REQUIREMENTS

A. Comply with requirements of Section 01 70 00 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 ELECTRONIC DOCUMENT SUBMITTAL SERVICE

A. Summary:
   1. Shop drawing and product data submittals shall be transmitted to Architect in electronic (PDF) format using Submittal Exchange, a website service designed specifically for transmitting submittals between construction team members.
   2. The intent of electronic submittals is to expedite the construction process by reducing paperwork, improving information flow, and decreasing turnaround time.

3. The electronic submittal process is not intended for color samples, color charts, or physical material samples.

B. Procedures:
   1. Submittal Preparation - Contractor may use any or all of the following options:
      a. Subcontractors and Suppliers provide electronic (PDF) submittals to Contractor via the Submittal Exchange website.
      b. Subcontractors and Suppliers provide paper submittals to General Contractor who elec- tronically scans and converts to PDF format.
      c. Subcontractors and Suppliers provide paper submittals to Scanning Service which elec- tronically scans and converts to PDF format.
   2. Contractor shall review and apply electronic stamp certifying that the submittal complies with the requirements of the Contract Documents including verification of manufacturer / product, dimensions and coordination of information with other parts of the work.
   3. Contractor shall transmit each submittal to Architect using the Submittal Exchange website, www.submittalexchange.com.
   4. Architect / Engineer review comments will be made available on the Submittal Exchange website for downloading. Contractor will receive email notice of completed review.
   5. Distribution of reviewed submittals to subcontractors and suppliers is the responsibility of the Contractor.
      a. Submit paper copies of reviewed submittals at project closeout for record purposes in ac- cordance with Section 01 77 00 – Execution and Closeout Requirements.

C. Costs:
   1. The cost of Submittal Exchange services has been paid in full by the Owner.
   2. At Contractor's option, training is available from Submittal Exchange regarding use of website and PDF submittals. Contact Submittal Exchange at 1-800-714-0024.
   3. Internet Service and Equipment Requirements:
      a. Email address and Internet access at Contractor's main office.
      b. Adobe Acrobat (www.adobe.com), Bluebeam PDF Revu (www.bluebeam.com), or other similar PDF review software for applying electronic stamps and comments.

D. Training: One, one-hour, web-based training session will be arranged for all participants, with representatives of Architect and Contractor participating; further training is the responsibility of the user of the service.
   1. Representatives of City are scheduled and included in this training.

E. Project Closeout: Architect will determine when to terminate the service for the project and is responsible for obtaining archive copies of files for City.

3.02 PRECONSTRUCTION MEETING

A. City will schedule two meetings after Notice of Award. They are:
   1. Standard preconstruction meeting.
   2. CWTA preconstruction meeting, with Community Workforce and Training Agreement CWTA representatives in attendance.

B. Attendance Required at each meeting:
   1. City.
   2. Architect.
   3. Contractor.
   4. Construction Manager.
   5. Community Workforce and Training Agreement CWTA representatives will attend the meeting designated for tha purpose.

C. Agenda for standard precon meeting follows (agenda for CWTA meeting to be determined):
   1. Execution of City-Contractor Agreement, aka the Construction Contract.
   2. Submission of executed bonds and insurance certificates.
   3. Distribution of Contract Documents.

4. Submission of list of subcontractors, list of products, schedule of values, and progress schedule.
5. Designation of personnel representing the parties to Contract.
6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
7. Scheduling.

D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, City, Construction Manager, participants, and those affected by decisions made.

3.03 SITE MOBILIZATION MEETING

A. Attendance Required:
1. Contractor.
2. City.
3. Architect.
4. Construction Manager.
5. Contractor's superintendent.
6. Major subcontractors.

B. Agenda:
1. Use of premises by City and Contractor.
2. City's requirements.
3. Construction facilities and controls provided by City.
4. Temporary utilities provided by City.
5. Survey and building layout.
6. Security and housekeeping procedures.
7. Schedules.
8. Application for payment procedures.
9. Procedures for testing.
10. Procedures for maintaining record documents.
11. Requirements for start-up of equipment.
12. Inspection and acceptance of equipment put into service during construction period.

C. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, City, participants, and those affected by decisions made.

3.04 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the work at maximum weekly intervals.

B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

C. Attendance Required:
1. Contractor.
2. City.
3. Architect.
4. Construction Manager.
5. Contractor's superintendent.
6. Major subcontractors.

D. Agenda:
1. Review minutes of previous meetings.
2. Review of work progress.
3. Field observations, problems, and decisions.
4. Identification of problems that impede, or will impede, planned progress.
5. Review of submittals schedule and status of submittals.

6. Maintenance of progress schedule.
7. Corrective measures to regain projected schedules.
8. Planned progress during succeeding work period.
9. Maintenance of quality and work standards.
10. Effect of proposed changes on progress schedule and coordination.
11. Other business relating to work.

E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, City, participants, and those affected by decisions made.

3.05 CONSTRUCTION PROGRESS SCHEDULE

A. Refer to Section - 00 72 13 Special Provisions for requirements regarding the project schedule.

B. Within 10 days after date of Notice of Award, submit preliminary schedule defining planned operations for the first 60 days of work, with a general outline for remainder of work.

C. If preliminary schedule requires revision after review, submit revised schedule within 10 days.

D. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.

E. Include written certification that major contractors have reviewed and accepted proposed schedule.

F. Within 10 days after joint review, submit complete schedule.
1. Provide 3 week look-ahead schedule weekly, for review and discussion at construction meetings.

G. Submit updated schedule with each Application for Payment. This is a pre-requisite for review of Contractor's monthly application for payment. Failure to so submit the updated schedule will result in delay in processing the application until an acceptable schedule is submitted.

H. If a schedule acceptable to City is not received within (3) months of NTP, this is grounds for dismissal and termination of the contract.

3.06 DAILY CONSTRUCTION REPORTS

A. Include only factual information. Do not include personal remarks or opinions regarding operations and/or personnel.

B. In addition to transmitting electronically a copy to City and Architect, submit two printed copies at daily intervals.
1. Submit in format acceptable to City.
2. Include sign-in sheets.

C. Prepare a daily construction report recording the following information concerning events at Project site and project progress:
1. Date.
2. High and low temperatures, and general weather conditions.
3. Safety, environmental, or industrial relations incidents.
4. Meetings and significant decisions.
5. Stoppages, delays, shortages, and losses. Include comparison between scheduled work activities (in Contractor's most recently updated and published schedule) and actual activities. Explain differences, if any. Note days or periods when no work was in progress and explain the reasons why.
6. Testing and/or inspections performed.
7. Signature of Contractor's authorized representative.

3.07 PROGRESS PHOTOGRAPHS AND VIDEOS

A. Submit photographs with each application for payment, taken not more than 3 days prior to submission of application for payment. At contractors option, video can be used in lieu of photopraghs.

B. Photography Type: Digital; electronic files.

C. Provide photographs of site and construction throughout progress of work produced by an experienced photographer, acceptable to Architect.

D. In addition to periodic, recurring views, take photographs of each of the following events:
   1. Completion of site clearing.
   2. Excavations in progress.
   3. Foundations in progress and upon completion.
   4. Structural framing in progress and upon completion.
   5. Enclosure of building, upon completion.
   6. Final completion, minimum of ten (10) photos.

E. Take videos as evidence of existing project conditions as follows:
   1. All interior views before interior demolition: All interior spaces of Building 1 and Building 2 organized by floor and by room.
   2. All interior views after interior demolition: All interior spaces of Building 1 and Building 2 organized by floor and by room.
   3. All exterior views: All exteriors of Building 1 and Building 2.

F. Views:
   1. Provide non-aerial photographs from four cardinal views at each specified time, until date of Substantial Completion.
   2. Consult with Architect for instructions on views required.
   3. Provide factual presentation.
   4. Provide correct exposure and focus, high resolution and sharpness, maximum depth of field, and minimum distortion.

3.08 COORDINATION DRAWINGS

A. Provide information required by Project Coordinator for preparation of coordination drawings.

B. Review drawings prior to submission to Architect.

3.09 REQUESTS FOR INTERPRETATION (RFI)

A. Definition: A request seeking one of the following:
   1. An interpretation, amplification, or clarification of some requirement of Contract Documents arising from inability to determine from them the exact material, process, or system to be installed; or when the elements of construction are required to occupy the same space (interference); or when an item of work is described differently at more than one place in Contract Documents.
   2. A resolution to an issue which has arisen due to field conditions and affects design intent.

B. Whenever possible, request clarifications at the next appropriate project progress meeting, with response entered into meeting minutes, rendering unnecessary the issuance of a formal RFI.

C. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
   1. Prepare a separate RFI for each specific item.
      a. Review, coordinate, and comment on requests originating with subcontractors and/or materials suppliers.
      b. Do not forward requests which solely require internal coordination between subcontractors.
   2. Prepare in a format and with content acceptable to City.
      a. Use AIA G716 - Request for Information, or similar.
   3. Prepare using software provided by the Electronic Document Submittal Service.
   4. Combine RFI and its attachments into a single electronic file. PDF format is preferred.

D. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.

1. Include in each request Contractor's signature attesting to good faith effort to determine from Contract Documents information requiring interpretation.
2. Unacceptable Uses for RFIs: Do not use RFIs to request the following::
   a. Approval of submittals (use procedures specified elsewhere in this section).
   b. Approval of substitutions (see Section - 01 60 00 - Product Requirements)
   c. Changes that entail change in Contract Time and Contract Sum (comply with provisions of the Conditions of the Contract).
   d. Different methods of performing work than those indicated in the Contract Drawings and Specifications (comply with provisions of the Conditions of the Contract).
3. Improper RFIs: Requests not prepared in compliance with requirements of this section, and/or missing key information required to render an actionable response. They will be returned without a response, with an explanatory notation.
4. Frivolous RFIs: Requests regarding information that is clearly indicated on, or reasonably inferable from, Contract Documents, with no additional input required to clarify the question. They will be returned without a response, with an explanatory notation.
   a. The City reserves the right to assess the Contractor for the costs (on time-and-materials basis) incurred by the Architect, and any of its consultants, due to processing of such RFIs.

E. Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.
1. Official Project name and number, and any additional required identifiers established in Contract Documents.
2. City's, Architect's, and Contractor's names.
3. Discrete and consecutive RFI number, and descriptive subject/title.
4. Reference to particular Contract Document(s) requiring additional information/interpretation. Identify pertinent drawing and detail number and/or specification section number, title, and paragraph(s).
5. Annotations: Field dimensions and/or description of conditions which have engendered the request.
6. Contractor's suggested resolution: A written and/or a graphic solution, to scale, is required in cases where clarification of coordination issues is involved, for example; routing, clearances, and/or specific locations of work shown diagrammatically in Contract Documents. If applicable, state the likely impact of the suggested resolution on Contract Time or the Contract Sum.

F. Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.

G. RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.

H. Review Time: Architect will respond and return most RFIs to Contractor within ten (10) working days of receipt, plus five (5) working days where Building Dept. and/or Fire Dept. review is required. For the purpose of establishing the start of the mandated response period, RFIs received after 12:00 noon will be considered as having been received on the following regular working day.
1. Response period may be shortened or lengthened for specific items, subject to mutual agreement, and recorded in a timely manner in progress meeting minutes.

I. Responses: Content of answered RFIs will not constitute in any manner a directive or authorization to perform extra work or delay the project. If in Contractor's belief it is likely to lead to a change to Contract Sum or Contract Time, promptly issue a notice to this effect, and follow up with an appropriate Change Order request to City.
1. Response may include a request for additional information, in which case the original RFI will be deemed as having been answered, and an amended one is to be issued forthwith. Identify the amended RFI with an R suffix to the original number.
2. Do not extend applicability of a response to specific item to encompass other similar conditions, unless specifically so noted in the response.

3. Notify Architect within seven calendar days if an additional or corrected response is required by submitting an amended version of the original RFI, identified as specified above.
4. RFI are Contractor's document and the response thereto is never sealed by the Architect. Should a change in plans or specifications be required to address a contractor's quesiton, an Architects Supplemental Instruction ASI will be issued which will be sealed by the Architect.

3.10 SUBMITTAL SCHEDULE

A. Submit to Architect for review a schedule for submittals, aka Submittal Schedule, in tabular format.
   1. Coordinate with Contractor's construction schedule and schedule of values.
   2. Format schedule to allow tracking of status of submittals throughout duration of construction.
   3. Arrange information to include scheduled date for initial submittal, specification number and title, submittal category (for review or for information), description of item of work covered, and role and name of subcontractor.
   4. Account for time required for preparation, review, manufacturing, fabrication and delivery when establishing submittal delivery and review deadline dates.
      a. For assemblies, equipment, systems comprised of multiple components and/or requiring detailed coordination with other work, allow for additional time to make corrections or revisions to initial submittals, and time for their review.

3.11 SUBMITTALS FOR REVIEW

A. When the following are specified in individual sections, submit them for review:
   1. Product data.
   2. Shop drawings.
   3. Samples for selection.
   4. Samples for verification.

B. Submit to Architect for review for the limited purpose of checking for compliance with information given and the design concept expressed in Contract Documents.

C. Samples will be reviewed for aesthetic, color, or finish selection.

D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 78 00 - Closeout Submittals.

3.12 SUBMITTALS FOR INFORMATION

A. When the following are specified in individual sections, submit them for information:
   1. Design data.
   2. Certificates.
   3. Test reports.
   4. Inspection reports.
   5. Manufacturer's instructions.
   6. Manufacturer's field reports.
   7. Other types indicated.

B. Submit for Architect's knowledge as contract administrator or for City.

3.13 SUBMITTALS FOR PROJECT CLOSEOUT

A. Submit Correction Punch List for Substantial Completion.

B. Submit Final Correction Punch List for Substantial Completion.

C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 01 78 00 - Closeout Submittals:
   1. Project record documents.

2. Operation and maintenance data.
3. Warranties.
4. Bonds.
5. Other types as indicated.

D. Submit for City's benefit during and after project completion.

3.14 NUMBER OF COPIES OF SUBMITTALS

A. Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.

B. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
   1. After review, produce duplicates.
   2. Retained samples will not be returned to Contractor unless specifically so stated.

3.15 SUBMITTAL PROCEDURES

A. General Requirements:
   1. Use a single transmittal for related items.
   2. Transmit using approved form.
      a. Use Form AIA G810 or similar.
   3. Sequentially identify each item. For revised submittals use original number and a sequential numerical suffix.
   4. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
   5. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
      a. Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.
   6. Deliver each submittal on date noted in submittal schedule, unless an earlier date has been agreed to by all affected parties, and is of the benefit to the project.
      a. Send submittals in electronic format via email to Architect.
   7. Schedule submittals to expedite the Project, and coordinate submission of related items.
      a. For each submittal for review, allow fifteen (15) working days excluding delivery time to and from the Contractor, plus five (5) working days where Building Dept. and/or Fire Dept. review is required.
      b. For sequential reviews involving approval from authorities having jurisdiction (AHJ), in addition to Architect's approval, allow an additional 30 days.
   8. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
   9. Provide space for Contractor and Architect review stamps.
   10. When revised for resubmission, identify all changes made since previous submission.
   11. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.
   12. Incomplete submittals will not be reviewed, unless they are partial submittals for distinct portion(s) of the work, and have received prior approval for their use.
   13. Submittals not requested will not be recognized or processed.

B. Product Data Procedures:
   1. Submit only information required by individual specification sections.
   2. Collect required information into a single submittal.
   3. Do not submit (Material) Safety Data Sheets for materials or products.

C. Shop Drawing Procedures:

1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work.
2. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.

D. Samples Procedures:
1. Transmit related items together as single package.
2. Identify each item to allow review for applicability in relation to shop drawings showing installation locations.

3.16 SUBMITTAL REVIEW

A. Submittals for Review: Architect will review each submittal, and take appropriate action.

B. Submittals for Information: Architect will acknowledge receipt and review. See below for actions to be taken.

C. Architect's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.
1. Notations may be made directly on submitted items and/or listed on appended Submittal Review cover sheet.

D. Architect's and consultants' actions on items submitted for review:
1. Authorizing purchasing, fabrication, delivery, and installation:
a. "Reviewed", or language with same legal meaning.
b. "Reviewed, See Comments", or language with same legal meaning.
c. "Reviewed and Resubmit", or language with same legal meaning.
1) Resubmit corrected item, with review notations acknowledged and incorporated. Resubmit separately, or as part of project record documents.
2) Non-responsive resubmittals may be rejected.
2. Not Authorizing fabrication, delivery, and installation:
a. "Revise and Resubmit".
1) Resubmit revised item, with review notations acknowledged and incorporated.
2) Non-responsive resubmittals may be rejected.
b. "Rejected".
1) Submit item complying with requirements of Contract Documents.

E. Architect's and consultants' actions on items submitted for information:
1. Items for which no action was taken:
a. "Received" - to notify the Contractor that the submittal has been received for record only.
2. Items for which action was taken:
a. "Reviewed" - no further action is required from Contractor.

END OF SECTION 01 30 00

This page intentionally left blank

SECTION 01 35 53
SECURITY PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Security measures including entry control, personnel identification, and miscellaneous restrictions.

1.02 RELATED REQUIREMENTS

A. Standard Specifications and Section - 00 72 13 Special Provisions: Additional provisions which may relate to security.

B. Section 01 10 00 - Summary: use of premises and occupancy.

C. Section 01 50 00 - Temporary Facilities and Controls: Temporary lighting.

1.03 PROTECTION

A. Continuously maintain protection as necessary to protect the Work, as a whole and in part, and adjacent property and improvements from accidents, injuries, or damage.

B. Provide and maintain in good condition all protective measures required to adequately protect the public from hazards resulting from the Work and to exclude unauthorized persons from the Work. When regulated by Building Code, Cal OSHA, or other authority, such legal requirements for protection shall be considered as minimum requirements. Be responsible for the protection in excess of such minimum requirements as required.

1.04 CONTROL OF SITE

A. Ensure that no alcohol, firearms, weapons, or controlled substance enters or is used at the Site. Immediately remove from the Site and terminate the employment of any employee found in violation of this provision.

1.05 SITE SECURITY

A. As part of the Work included within the Contract Price, Contractor shall take and be fully responsible for all reasonably required measures to protect and maintain the security of persons, existing facilities and property at the Site, including without limitation preventing theft, loss, vandalism, graffiti, and improper concealment of personal property of the City and all persons lawfully present on the Site, and including times where workers are not present on the Site. Contractor's measures shall include, at a minimum, installing a temporary chain-link fence with locking gate surrounding the Site if so instructed by the Engineer.

B. No claim shall be made against City by reason of any act of an employee or trespasser, and Contractor shall repair all damage to City's property resulting from Contractor's failure to provide adequate security measures.

C. Contractor shall maintain a lock on the Construction access gate at all times.

D. Contractor shall supply additional security fencing, barricades, lighting, and other security measures as required to protect and control the Site.

E. For all work in the Police Evidence Storage area in the basement of Building 2, Contractor shall coordinate and cooperate with City of Stockton's police security program. The Contractor personnel who will be working in this area must pass Level 2 background checks and submit information on City's form, form following. They must pass the following level 2 checks: local record check, warrants check, and RAP (for purposes of "Building Security"). In order to run the computer checks involved, the contractor must provide the full name and date of birth of those persons who will be working either in the building or on site no later than 2 weeks prior to work commencing. The Police Records Supervisor will contact the Contractor and advise them of the status of their employees (approved or unapproved). Unapproved employees will not be allowed access to the police department building or site. Approved individuals will be provided with photo identification that must be worn in a visible manner while on the job. These IDs must be returned to the Stockton Police Department at the end of the project.

F. For all work in the Police Evidence Storage area, Contractor shall provide City with 48 hours notice to schedule any work in this area. Police Department will need to provide access and be present at all times during all work in the basement.

1.06 SAFETY PROGRAM

A. Fifteen (15) Days prior to the start of the Work, Contractor shall submit a Safety Program. Comply with the Safety Program and all applicable federal, state, and local regulation codes, rules, law and ordinances.

B. Receipt and/or review of the Safety Program by City, Engineer, or City's representative shall not relieve Contractor of any responsibility for complying with all applicable safety regulations.

C. It is essential that Contractor and each Subcontractor implement an effective and vigorous Safety and Health Program to cover their respective portions of the Work. Subject to Contractor's overall responsibility for Project safety, it shall be understood that the full responsibility for providing a safe place to work with respect to their respective portions of the Work rests with each individual Contractor and Subcontractor.

D. Safety Program components:
   1. Injury and Illness Prevention Program (IIPP): Conforming to the General Industrial Safety Orders (CCR Title 8, Division 1, Chapter 4, Subchapter 7, Section 3203), and the California Labor Code (Section 6401.7).
   2. Site-Specific Health and Safety Plan (HSP): Describing health and safety procedures that shall be implemented during the Work in order to ensure safety of the public and those performing the Work. Follow the guidelines for a HSP listed in f29 C.F.R. 1910.120.

E. The wearing of hard hats shall be mandatory at all times for personnel on Site. Supply sufficient hard hats to equip properly all employees and visitors.

F. Whenever an exposure exists, appropriate personal protective equipment (PPE) shall be used by all affected personnel. Supply PPE to all personnel under Contractor's direction.

1.07 SAFETY REQUIREMENTS

A. Standards: Maintain the Project in accordance with state and local safety and insurance standards.

B. Hazards Control:
   1. Store volatile wastes in covered metal containers and remove from premises daily.
   2. Prevent accumulation of wastes that create hazardous conditions.
   3. Provide adequate ventilation during use of volatile or noxious substances.

C. Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.
   1. Do not burn or bury rubbish or waste material on the Site.
   2. Do not dispose of volatile wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains.
   3. Do not dispose of wastes into streams or waterways.

D. Provide accident information on the forms provided by Contractor. This information shall be provided on the same day as the occurrence of said incident.

1.08 SITE SAFETY OFFICER

A. Designate one of Contractor's staff as "Site Safety Officer" whose duties shall include the responsibility for enforcing the environmental protection provisions of the Contract Documents including safety and health, the requirements of the Occupational Safety and Health Act, and other applicable federal, state, and local standards.

B. Submit for review to City Engineer the intended traffic flow plan, security plan, program for temporary structures, housecleaning plan, demolition program, and environmental safety and health plan. After review by City, the implementation and enforcement of these plans shall become the responsibility of the Site Safety Officer. Any changes in the plans shall be

requested by Contractor through the Site Safety Officer for written concurrence by City.

1.09 ENTRY CONTROL

A. Restrict entrance of persons and vehicles into Project site and existing facilities.

B. Allow entrance only to authorized persons with proper identification.

C. Maintain log of workers and visitors, make available to City on request.

D. City will control entrance of persons and vehicles related to City's operations.

1.10 PERSONNEL IDENTIFICATION

A. Provide identification badge to each person authorized to enter premises. Contractor and all subcontractors will need to pass a security clearance screening by the Stockton Police Department which will include fingerprinting and a copy of a current state issued identification (e.g. driver’s license). See form following for to be used for security clearance screening.

B. Badge To Include: Name of individual, photo head shot, assigned number, expiration date and company logo.

C. The City retains the right to refuse project access to any construction personnel and the contractor shall be responsible for identifying a suitable replacement.

D. Require return of badges at expiration of their employment on the Work.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

(CONTRACTOR PERSONAL INFORMATION FORM FOLLOWING, ONLY REQUIRED FOR WORK IN POLICE EVIDENCE STORAGE AREA IN BASEMENT OF BUILDING 2)

This page intentionally left blank

STOCKTON POLICE DEPARMENT
CONTRACTOR PERSONAL INFORMATION
FOR
NEW CITY HALL RENOVATIONS & RELOCATION PROJECT
(EO16015)

NAME	
ADDRESS	
CONTACT #	
DATE OF BIRTH	
DRIVERS LIC. #	
EMPLOYER	
SUPERVISOR	
SUPERVISOR CONTACT #	

PHOTOCOPY OF DRIVERS LICENCE

This page intentionally left blank

SECTION 01 40 00
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Submittals.

B. Quality assurance.

C. References and standards.

D. Testing and inspection agencies and services.

E. Contractor's construction-related professional design services.

F. Contractor's design-related professional design services.

G. Control of installation.

H. Mock-ups.

I. Tolerances.

J. Manufacturers' field services.

K. Defect Assessment.

1.02 RELATED REQUIREMENTS

A. Standard Specifications and Section - 00 72 13 Special Provisions: Additional requirements related to quality requirements and procedures.

B. Section 01 21 00 - Allowances: Allowance for payment of scanning of existing post-tensioned reinforced concrete slabs services.

C. Section 01 30 00 - Administrative Requirements: Submittal procedures.

D. Section 01 71 23 - Field Engineering: Requirements related to field engineering.

E. Section 01 60 00 - Product Requirements: Requirements for material and product quality.

1.03 REFERENCE STANDARDS

A. ASTM C1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants 2008 (Reapproved 2014).

B. ASTM C1077 - Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation 2017.

C. ASTM C1093 - Standard Practice for Accreditation of Testing Agencies for Masonry 2019.

D. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction 2019.

E. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection 2020.

F. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing 2015.

G. ASTM E699 - Standard Specification for Agencies Involved in Testing, Quality Assurance, and Evaluating of Manufactured Building Components 2016.

H. IAS AC89 - Accreditation Criteria for Testing Laboratories 2018.

1.04 DEFINITIONS

A. Contractor's Quality Control Plan: Contractor's management plan for executing the Contract for Construction.

B. Contractor's Professional Design Services: Design of some aspect or portion of the project by party other than the design professional of record. Provide these services as part of the Contract for Construction.

1. Design Services Types Required:
    a. Construction-Related: Services Contractor needs to provide in order to carry out the Contractor's sole responsibilities for construction means, methods, techniques, sequences, and procedures.
    b. Design-Related: Design services explicitly required to be performed by another design professional due to highly-technical and/or specialized nature of a portion of the project. Services primarily involve engineering analysis, calculations, and design, and are not intended to alter the aesthetic aspects of the design.

C. Design Data: Design-related, signed and sealed drawings, calculations, specifications, certifications, shop drawings and other submittals provided by Contractor, and prepared directly by, or under direct supervision of, appropriately licensed design professional.

1.05 CONTRACTOR'S CONSTRUCTION-RELATED PROFESSIONAL DESIGN SERVICES

A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.

B. Provide such engineering design services as may be necessary to plan and safely conduct certain construction operations, pertaining to, but not limited to the following:
1. Temporary sheeting, shoring, or supports.
2. Temporary scaffolding.
3. Temporary bracing.
4. Temporary foundation underpinning.
5. Temporary stairs or steps required for construction access only.
6. Temporary hoist(s) and rigging.
7. Investigation of soil conditions to support construction equipment.
8. Field engineering.
9. Other as may be required to complete the work.

1.06 CONTRACTOR'S DESIGN-RELATED PROFESSIONAL DESIGN SERVICES

A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.

B. Base design on performance and/or design criteria indicated in individual specification sections.

C. Scope of Contractor's Professional Design Services: Provide for the following items of work:
1. Fire Protection System Design: As described in Section 21 13 13 - Wet Pipe Sprinkler Systems, Section 21 22 00 - Clean Agent Fire Suppression, including any underground fire lines, fire pumps, etc. as may be further specified and shown on plans. Scope of Fire Protection System Design extends from offsite main connection to entirety of both Buildings. Design shall be subject to Fire Marshal review as a deferred approval item. Calculations as may be required to confirm design of fire suppression systems including underground service, risers, standpipes, and distribution in the buildings, and as needed for approval of the complete system by the Fire authority having jurisdiction.
2. Fire Detection and Alarm System Design: As described in Section 28 31 00 - Fire Detection and Alarm, and as may be shown on plans. Subject to Fire Marshal review as a deferred approval item.
3. Structural Design of Seismic Controls for Fire systems: As described in Section - 21 05 29 Hangers and Support for Fire Suppression and Equipment, 21 05 48 Vibration and Seismic Controls for Fire Suppression Piping and Equipment, et al.
4. Structural Design of Seismic Controls for Mechanical: As described in Sections 23 05 29 Hangers and Supports For HVAC Piping and Equipment, 21 05 48 - Vibration and Seismic Controls for Fire Suppression Piping and Equipment, 23 05 30 Hangers and Support For HVAC Ductwork, 21 05 48 - Vibration and Seismic Controls for Fire Suppression Piping and Equipment, et al.
5. Structural Design of Seismic Controls for Plumbing: As described in Section 22 05 29 Hangers and Supports For Plumbing Piping and Equipment, 22 05 48 - Vibration and Seismic Controls for Plumbing Piping and Equipment, et al.

6. Structural Design of Seismic Controls for Electrical: As described in Section 26 05 02 Supporting From Building Structure, 26 05 03 Seismic Certification Of Equipment And Non-structural Components, et al.
7. Design of Seismic Component of Structural Supports and Anchors: For piping and equipment supports as may be required.
8. Distributed Antenna System (DAS) / Emergency Responder Radio Coverage System (ERRCS): As described in Section 27 53 19.
9. Other as required or as may be described in individual specification sections.

1.07 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for City's information.

C. Test Reports: After each test/inspection, promptly submit two copies of report to Architect and to Contractor.

1.08 QUALITY ASSURANCE

A. Designer Qualifications: Where professional engineering design services and design data submittals are specifically required of Contractor by Contract Documents, provide services of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

B. Contractor's Quality Control (CQC) Plan:
   1. Prior to start of work, submit a comprehensive plan describing how contract deliverables will be produced. Tailor CQC plan to specific requirements of the project. Include the following information:
      a. Management Structure: Identify personnel responsible for quality. Include a chart showing lines of authority.
         1) Include qualifications (in resume form), duties, responsibilities of each person assigned to CQC function.
      b. Management Approach: Define, describe, and include in the plan specific methodologies used in executing the work.
      c. City will not make a separate payment for providing and maintaining a Quality Control Plan. Include associated costs in Bid price.
      d. Acceptance of the plan is required prior to start of construction activities not including mobilization work. City's acceptance of the plan will be conditional and predicated on continuing satisfactory adherence to the plan. City reserves the right to require Contractor to make changes to the plan and operations, including removal of personnel, as necessary, to obtain specified quality of work results.

C. Quality-Control Personnel Qualifications. Engage a person with requisite training and experience to implement and manage quality assurance (QA) and quality control (QC) for the project.

1.09 REFERENCES AND STANDARDS

A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Comply with reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.

C. Obtain copies of standards where required by product specification sections.

D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.

E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.

F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from Contract Documents by mention or inference otherwise in any reference document.

1.10 TESTING AND INSPECTION AGENCIES AND SERVICES

A. City will employ and pay for services of an independent testing agency to perform specified testing and inspection, except for the following:
   1. Contractor to pay for non-destructive investigations including GPR and/or X-ray scanning of existing floors and walls to be cored per plans and specifications.
   2. Contractor to pay for any potholing of site required to determine exact existing utility locations prior to proceeding with the construction per plans and specifications.

B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.

D. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Have work performed by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 MOCK-UPS

A. Accepted mock-ups establish the standard of quality the Architect will use to judge the Work.

B. Notify Architect and Owner seven (7) working days in advance of dates and times when mock-ups will be constructed.

C. Tests shall be performed under provisions identified in this section and identified in the respective product specification sections.

D. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.

E. Architect will use accepted mock-ups as a comparison standard for the remaining Work.

F. Where mock-up has been accepted by Architect and is specified in product specification sections to be removed, protect mock-up throughout construction, remove mock-up and clear area when directed to do so by Architect.

3.03 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

3.04 TESTING AND INSPECTION

A. Testing Agency Duties:
   1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
   2. Perform specified sampling and testing of products in accordance with specified standards.
   3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
   4. Promptly notify Architect and Contractor of observed irregularities or non-compliance of Work or products.
   5. Perform additional tests and inspections required by Architect.
   6. Submit reports of all tests/inspections specified.

B. Limits on Testing/Inspection Agency Authority:
   1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
   2. Agency may not approve or accept any portion of the Work.
   3. Agency may not assume any duties of Contractor.
   4. Agency has no authority to stop the Work.

C. Contractor Responsibilities:
   1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
   2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
   3. Provide incidental labor and facilities:
      a. To provide access to Work to be tested/inspected.
      b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
      c. To facilitate tests/inspections.
      d. To provide storage and curing of test samples.
   4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
   5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
   6. Arrange with City's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

D. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.

E. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

3.05 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust, and balance equipment as applicable, and to initiate instructions when necessary.

B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.06 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not complying with specified requirements.

END OF SECTION 01 40 00

SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary telecommunications services.

B. Temporary sanitary facilities.

C. Temporary Controls: Barriers, enclosures, and fencing.

D. Security requirements (see Section 01 35 53 - Security Procedures for Police Evidence Storage area) .

E. Waste removal facilities and services.

1.02 RELATED REQUIREMENTS

A. Standard Specifications and Section - 00 72 13 Special Provisions: Additional requirements related to temporary facilities, use of property.

B. Section 01 35 53 - Security Procedures (USE WORD DOC!): special security procedures applying to all work in Building 2, Basement - Police Evidence Storage.

C. Section 01 51 00 - Temporary Utilities.

D. Section 01 52 13 - Field Offices and Sheds.

E. Section 01 55 00 - Vehicular Access and Parking.

F. Section 01 57 19 - Temporary Environmental Controls.

G. Section 01 58 13 - Temporary Project Signage.

H. Section 01 91 00 - General Commissioning Requirements.

1.03 TEMPORARY UTILITIES - SEE SECTION 01 51 00

A. City will provide the following at contractor expense:
   1. Electrical power and metering, consisting of connection to existing facilities.
   2. Water supply, consisting of connection to existing facilities.

B. Provide and pay for all electrical power, lighting, water, heating and cooling, and ventilation required for construction purposes.

C. Existing facilities may not be used.

D. New permanent facilities may not be used.

E. Use trigger-operated nozzles for water hoses, to avoid waste of water.

1.04 TELECOMMUNICATIONS SERVICES

A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization.

B. Provide equivalent equipment and connections for City's field office.

C. Telecommunications services shall include:
   1. Windows-based personal computer dedicated to project telecommunications, with necessary software and laser printer.
   2. Telephone Land Lines: One line, minimum; one handset per line.
   3. Internet Connections: Minimum of one; DSL modem or faster.
   4. Email: Account/address reserved for project use.

D. Upon project completion, cancel all services and demo point to point cabling.

1.05 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.

B. Use of existing facilities is not permitted.

C. New permanent facilities may not be used during construction operations.

D. Maintain daily in clean and sanitary condition.

E. At end of construction, return facilities to same or better condition as originally found.

1.06 TEMPORARY CONSTRUCTION TRANSPORT FACILITIES

A. Contractor may not use any existing elevators for transport of material or personnel.

B. Contractor to provide one exterior temporary construction elevator for each of Building 1 and Building 2 for all construction transport of material and personnel. Elevator shall serve each floor and roof. Exception:
   1. Basement of Building 2 will be accessed via existing stairwells.

C. Remove and replace glazing in existing curtain wall system as needed to accommodate temporary construction elevator landings and access into each floor of buidings. Safetly store removed glazing units for contractor reinstallation later.

D. Maintain daily in clean and sanitary condition.

E. At end of construction, return existing curtain wall system including glazing and any other affected facilities to same or better condition as originally found.

1.07 TEMPORARY CONSTRUCTION EQUIPMENT ACCESS

A. Remove and replace existing doorways, storefront, and glazing in existing curtain wall system as needed to admit necessary construction equipment into the buildings.

1.08 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.

B. Provide barricades and covered walkways required by governing authorities for public rights-of-way.

C. Provide protection for plants designated to remain. Replace damaged plants.

D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.09 FENCING AND STAGING

A. Construction: Commercial grade chain link fence.

B. Provide 6 foot high temporary construction fence around construction site; equip with vehicular and pedestrian gates with locks. This fence must provide continuous closure around both Building 1 and Building 2, the parking lot, and the rear courtyard area, and all areas of work. It is not required to provide enclosure around the existing secure lot to the west, except where contractor may want to add fencing to enclose any staging and storage use of that area. See plans for more information.

C. Contractor is permitted to use the existing secure parking lot to the west for staging and storage of materials. If so, additional 6 foot high temporary construction fence with gates will be required there at Contractor's expense. No material storage is permitted in the rear courtyard area. See plans for more information.

1.10 EXTERIOR ENCLOSURES

A. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

1.11 SECURITY - SEE SECTION 01 35 53

1.12 VEHICULAR ACCESS AND PARKING - SEE SECTION 01 55 00

A. Coordinate access and haul routes with governing authorities and City.

B. Provide and maintain access to fire hydrants, free of obstructions.

C. Provide means of removing mud from vehicle wheels before entering streets.

D. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

1.13 WASTE REMOVAL

A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.

B. Provide containers with lids. Remove trash from site periodically.

C. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.

D. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

E. Remove and replace glazing in existing curtain wall system as needed to accommodate trash chute access into each floor of buidings.

1.14 PROJECT SIGNS - SEE SECTION 01 58 13

1.15 FIELD OFFICES - SEE SECTION 01 52 13

1.16 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection.

B. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated.

C. Clean and repair damage caused by installation or use of temporary work.

D. Restore any existing facilities used during construction to original condition.

E. Restore new permanent facilities used during construction to specified condition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 01 50 00

This page intentionally left blank

SECTION 01 51 00
TEMPORARY UTILITIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary Utilities: Provision of electricity, lighting, heat, ventilation, water, and cable for internet. Cable for internet is for telecommunications services, see under section 01 50 00- Temporary Facilities and Controls.

1.02 RELATED REQUIREMENTS

A. Standard Specifications and Section - 00 72 13 Special Provisions: Additional requirements for temporary utilities.

B. Section 01 50 00 - Temporary Facilities and Controls: temporary facilities and controls other than those for to utilities, and including telecommunications services.

1.03 REFERENCE STANDARDS

A. 29 CFR 1926 - Safety and Health Regulations for Construction Current Edition.

1.04 TEMPORARY ELECTRICITY

A. Cost: By Contractor.

B. Connect to City's existing power service.
   1. Exercise measures to conserve energy.
   2. Provide separate metering and reimburse City for cost of energy used.

C. Provide temporary electric feeder from existing building electrical service at location as directed.

D. Complement existing power service capacity and characteristics as required.

E. Provide power outlets for construction operations, with branch wiring and distribution boxes located at each floor. Provide flexible power cords as required.

F. Provide main service disconnect and over-current protection at convenient location and meter.

G. Permanent convenience receptacles may be utilized during construction.

1.05 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

A. Provide and maintain LED, compact fluorescent, or high-intensity discharge lighting as suitable for the application for construction operations in accordance with requirements of 29 CFR 1926 and authorities having jurisdiction.

B. Provide and maintain 1 watt/sq ft lighting to exterior staging and storage areas after dark for security purposes.

C. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.

D. Maintain lighting and provide routine repairs.

E. Permanent building lighting may be utilized during construction until which time it is to be demolished and replaced with new. Temporary lighting provided and paid for by Contractor will be thus required for this and for any areas of existing where lighting is inadequate.

1.06 TEMPORARY HEATING

A. Cost of Energy: By Contractor.

B. Provide heating devices and heat as needed to maintain specified conditions for construction operations.

C. Maintain minimum ambient temperature of 50 degrees F in areas where construction is in progress, unless indicated otherwise in specifications.

D. Existing heating facilities shall not be used.

1.07 TEMPORARY COOLING

A. Cost of Energy: By Contractor.

B. Provide cooling devices and cooling as needed to maintain specified conditions for construction operations.

C. Maintain maximum ambient temperature of 80 degrees F in areas where construction is in progress, unless indicated otherwise in specifications.

D. Existing cooling facilities shall not be used.

1.08 TEMPORARY VENTILATION

A. Existing ventilation equipment may not be used.

1.09 TEMPORARY WATER SERVICE

A. Cost of Water Used: By Contractor.

B. Connect to existing water source.
   1. Exercise measures to conserve water.
   2. Provide separate metering and reimburse City for cost of water used.

C. Extend branch piping with outlets located so water is available by hoses with threaded connections. Provide temporary pipe insulation to prevent freezing.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 01 51 00

SECTION 01 52 13
FIELD OFFICES AND SHEDS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary field offices for use of Owner and Architect/ Engineer.

B. Temporary field offices for use of Construction Manager. Owner and Architect/ Engineer.

C. Temporary field offices for use of Contractor.

D. Maintenance and removal.

1.02 RELATED REQUIREMENTS

A. Standard Specifications and Section - 00 72 13 Special Provisions: Additional requirements related to temporary facilities, use of property.

B. Section 01 10 00 - Summary: use of premises and responsibility for providing field offices.

C. Section 01 50 00 - Temporary Facilities and Controls.

1.03 USE OF EXISTING FACILITIES

A. Existing facilities shall not be used for field offices.

1.04 USE OF PERMANENT FACILITIES

A. Permanent facilities shall not be used for field offices.

PART 2 PRODUCTS

2.01 CONSTRUCTION

A. Portable or mobile buildings, or buildings constructed with floors raised above ground, securely fixed to foundations, with steps and landings at entrance doors.

B. Locate offices a minimum distance of 30 feet from existing and new structures.

C. Construction: Structurally sound, secure, weather tight enclosures for office. Maintain during progress of Work; remove when no longer needed.

D. Temperature Transmission Resistance of Floors, Walls, and Ceilings: Compatible with occupancy requirements.

E. Exterior Materials: Weather resistant, finished in one color.

F. Interior Materials in Offices: Sheet type materials for walls and ceilings, prefinished or painted; resilient floors and bases.

G. Lighting for Offices: 35 fc at desk top height, exterior lighting at entrance doors.

H. Fire Extinguishers: Appropriate type fire extinguisher at each office.

2.02 ENVIRONMENTAL CONTROL

A. Heating, Cooling, and Ventilating: Automatic equipment to maintain comfort conditions.

2.03 CONTRACTOR OFFICE AND FACILITIES

A. Size: For Contractor's needs and to provide space for project meetings.

B. Telephone: As specified in Section 01 50 00.

C. Furnishings in Meeting Area: Conference table and chairs to seat at least eight persons; racks and files for Contract Documents, submittals, and project record documents.

D. Other Furnishings: Contractor's option.

E. Equipment: Ten adjustable band protective helmets for visitors, one 10 inch outdoor weather thermometer .

2.04 CONSTRUCTION MANAGER FIELD OFFICE

A. Provide entrance door with new lock and two keys.

B. Construction Manager field office will also be used by City of Stockton and Architect staff.

C. Area: At least 12' x 48' in size, 576 sf total.

D. Windows: At least three, with minimum total area equivalent to 10 percent of floor area, with an operable sash and insect screen. Locate to provide views of construction area.

E. Electrical Distribution Panel: Two circuits minimum, 110 volt, 60 hz service.

F. Minimum four 110 volt duplex convenience outlets, one on each wall.

G. Telephone: As specified in Section 01 50 00.

H. Sanitary Facilities: As specified in Section 01 50 00.

I. Drinking Fountain: Convenient access by workers.

J. Furnishings:
   1. One desk 54 by 30 inch, with three drawers.
   2. One meeting table to seat at least four persons.
   3. One computer workstation with 24 by 48 inch work surface, CPU shelf, retractable keyboard tray, and space for computer monitor and 11 by 17 inch printer.
   4. Plan rack to hold working drawings, shop drawings, and record documents.
   5. Two swivel arm chairs.
   6. Two straight chairs.
   7. One waste basket per desk and table.

PART 3 EXECUTION

3.01 PREPARATION

A. Fill and grade sites for temporary structures to provide drainage away from buildings.

3.02 INSTALLATION

A. Install office spaces ready for occupancy 15 days after date fixed in Notice to Proceed.

B. Parking: Two hard surfaced parking spaces for use by City and Architect, connected to office by hard surfaced walk.

C. Employee Residential Occupancy: Not allowed on City's property.

3.03 MAINTENANCE AND CLEANING

A. Weekly janitorial services for offices; periodic cleaning and maintenance for offices.

B. Maintain approach walks free of mud and water.

3.04 REMOVAL

A. At completion of Work remove buildings, foundations, utility services, and debris. Restore areas.

END OF SECTION 01 52 13

SECTION 01 55 00
VEHICULAR ACCESS AND PARKING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Access roads.

B. Parking.

C. Existing pavements and parking areas.

D. Permanent pavements and parking facilities.

E. Construction parking controls.

F. Flag persons.

G. Flares and lights.

H. Haul routes.

I. Traffic signs and signals.

J. Maintenance.

K. Removal, repair.

L. Mud from site vehicles.

1.02 RELATED REQUIREMENTS

A. Standard Specifications and Section - 00 72 13 Special Provisions: Additional requirements related to traffic and vehicular access and parking.

B. Section 01 10 00 - Summary: For access to site, work sequence, and occupancy.

C. Section 01 50 00 Temporary Facilities and Controls: For traffic control related requirements.

D. Section 01 58 13 - Temporary Project Signage: Post Mounted and Wall Mounted Traffic Control and Informational Signs.

E. Section 31 21 13 - Site Grading: Specifications for earthwork and paving bases.

1.03 SUBMITTALS

A. Submit for City review and approval a traffic control plan for onsite parking and circulation, public sidewalk closures, and for street traffic during the time the water and other utility line connections and frontage improvements are being made inside the street right of way.

PART 2 PRODUCTS

2.01 MATERIALS

A. Temporary Construction: Contractor's option.

B. Materials for Permanent Construction: As specified in product specification sections, including earthwork, paving base, and topping.

2.02 SIGNS, SIGNALS, AND DEVICES

A. Post Mounted and Wall Mounted Traffic Control and Informational Signs: Specified in Section 01 58 13 - Temporary Project Signage.

B. Automatic Traffic Control Signals: As approved by local jurisdictions.

C. Traffic Cones and Drums, Flares and Lights: As approved by local jurisdictions.

D. Flag Person Equipment: As required by local jurisdictions.

PART 3 EXECUTION

3.01 ACCESS ROADS

A. Use of existing on-site streets and driveways for construction traffic is permitted.

B. Tracked vehicles not allowed on paved areas.

C. Extend and relocate as work progress requires, provide detours as necessary for unimpeded traffic flow.

D. Provide unimpeded access for emergency vehicles. Maintain 20 foot width driveways with turning space between and around combustible materials.

E. Provide and maintain access to fire hydrants free of obstructions.

3.02 PARKING

A. Use of designated areas of existing parking facilities by construction personnel is permitted.

B. Use of new parking facilities by construction personnel is not permitted.

C. When site space is not adequate, provide additional off-site parking.

D. Locate as indicated.

3.03 CONSTRUCTION PARKING CONTROL

A. Control vehicular parking to prevent interference with public traffic and parking, access by emergency vehicles, and City's operations.

B. Monitor parking of construction personnel's vehicles in existing facilities. Maintain vehicular access to and through parking areas.

C. Prevent parking on or adjacent to access roads or in non-designated areas.

3.04 FLAG PERSONS

A. Provide trained and equipped flag persons to regulate traffic when construction operations or traffic encroach on public traffic lanes.

3.05 FLARES AND LIGHTS

A. Use flares and lights during hours of low visibility to delineate traffic lanes and to guide traffic.

3.06 HAUL ROUTES

A. Consult with authority having jurisdiction, establish public thoroughfares to be used for haul routes and site access.

B. Confine construction traffic to designated haul routes.

C. Provide traffic control at critical areas of haul routes to regulate traffic, to minimize interference with public traffic.

3.07 TRAFFIC SIGNS AND SIGNALS

A. At approaches to site and on site, install at crossroads, detours, parking areas, and elsewhere as needed to direct construction and affected public traffic.

B. Relocate as work progresses, to maintain effective traffic control.

3.08 MAINTENANCE

A. Maintain traffic and parking areas in a sound condition free of excavated material, construction equipment, products, mud, snow, and ice.

B. Maintain existing paved areas used for construction; promptly repair breaks, potholes, low areas, standing water, and other deficiencies, to maintain paving and drainage in original, or specified, condition.

3.09 REMOVAL, REPAIR

A. Repair damage caused by installation.

3.10 MUD FROM SITE VEHICLES

A. Provide a means of removing mud from vehicle wheels before entering streets, and receive approval from City prior to implementing.

END OF SECTION 01 55 00

SECTION 01 57 19
TEMPORARY ENVIRONMENTAL CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Construction procedures to promote adequate indoor air quality after construction.

B. Building flush-out after construction and before occupancy.

C. Testing indoor air quality after completion of construction.

D. Testing air change effectiveness after completion of construction.

1.02 PROJECT GOALS

A. Dust and Airborne Particulates: Prevent deposition of dust and other particulates in HVAC ducts and equipment.
   1. Cleaning of ductwork is not contemplated under this Contract.
   2. Contractor shall bear the cost of cleaning required due to failure to protect ducts and equipment from construction dust.

B. Airborne Contaminants: Procedures and products have been specified to minimize indoor air pollutants.
   1. Furnish products meeting the specifications.
   2. Avoid construction practices that could result in contamination of installed products leading to indoor air pollution.

1.03 RELATED REQUIREMENTS

A. Standard Specifications and Section - 00 72 13 Special Provisions: Additional requirements related to environmental safety and protection of persons and property.

B. Section 01 40 00 - Quality Requirements: Testing and inspection services.

C. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

D. Section 01 91 00 - General Commissioning Requirements: Contractor's responsibilities in regard to commissioning.

1.04 REFERENCE STANDARDS

A. ASHRAE Std 129 - Measuring Air-Change Effectiveness 1997 (Reaffirmed 2002).

B. ASTM D5197 - Standard Test Method for Determination of Formaldehyde and Other Carbonyl Compounds in Air (Active Sampler Methodology) 2016.

C. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions From Indoor Sources Using Environmental Chambers 2017, v1.2.

D. EPA 600/4-90/010 - Compendium of Methods for the Determination of Air Pollutants in Indoor Air 1990.

E. EPA 625/R-96/010b - Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air 1999.

F. SMACNA (OCC) - IAQ Guidelines for Occupied Buildings Under Construction 2007.

1.05 DEFINITIONS

A. Adsorptive Materials: Gypsum board, acoustical ceiling tile and panels, carpet and carpet tile, fabrics, fibrous insulation, and other similar products.

B. Contaminants: Gases, vapors, regulated pollutants, airborne mold and mildew, and the like, as specified.

C. Particulates: Dust, dirt, and other airborne solid matter.

D. Wet Work: Concrete, plaster, coatings, and other products that emit water vapor or volatile organic compounds during installation, drying, or curing.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Indoor Air Quality Management Plan: Describe in detail measures to be taken to promote adequate indoor air quality upon completion; use SMACNA (OCC) as a guide.
   1. Submit not less than 60 days before enclosure of building.
   2. Identify potential sources of odor and dust.
   3. Identify construction activities likely to produce odor or dust.
   4. Identify areas of project potentially affected, especially occupied areas.
   5. Evaluate potential problems by severity and describe methods of control.
   6. Describe construction ventilation to be provided, including type and duration of ventilation, use of permanent HVAC systems, types of filters and schedule for replacement of filters.
   7. Describe cleaning and dust control procedures.

C. Interior Finishes Installation Schedule: Identify each interior finish that either generates odors, moisture, or vapors or is susceptible to adsorption of odors and vapors, and indicate air handling zone, sequence of application, and curing times.

D. Duct and Terminal Unit Inspection Report.

E. Air Contaminant Test Plan: Identify:
   1. Testing agency qualifications.
   2. Locations and scheduling of air sampling.
   3. Test procedures, in detail.
   4. Test instruments and apparatus.
   5. Sampling methods.

F. Air Contaminant Test Reports: Show:
   1. Location where each sample was taken, and time.
   2. Test values for each air sample; average the values of each set of 3.
   3. HVAC operating conditions.
   4. Certification of test equipment calibration.
   5. Other conditions or discrepancies that might have influenced results.

G. Ventilation Effectiveness Test Plan: Identify:
   1. Testing agency qualifications.
   2. Description of test spaces, including locations of air sampling.
   3. Test procedures, in detail; state whether tracer gas decay or step-up will be used.
   4. Test instruments and apparatus; identify tracer gas to be used.
   5. Sampling methods.

H. Ventilation Effectiveness Test Reports: Show:
   1. Include preliminary tests of instruments and apparatus and of test spaces.
   2. Calculation of ventilation effectiveness, E.
   3. Location where each sample was taken, and time.
   4. Test values for each air sample.
   5. HVAC operating conditions.
   6. Other information specified in ASHRAE Std 129.
   7. Other conditions or discrepancies that might have influenced results.

1.07 QUALITY ASSURANCE

A. Testing and Inspection Agency Qualifications: Independent testing agency having minimum of 5 years experience in performing the types of testing specified.

PART 2 PRODUCTS

2.01 MATERIALS

A. Low VOC Materials: See other sections for specific requirements for materials with low VOC content.

PART 3 EXECUTION

3.01 CONSTRUCTION PROCEDURES

A. Prevent the absorption of moisture and humidity by adsorptive materials by:
   1. Sequencing the delivery of such materials so that they are not present in the building until wet work is completed and dry.
   2. Delivery and storage of such materials in fully sealed moisture-impermeable packaging.
   3. Provide sufficient ventilation for drying within reasonable time frame.

B. Begin construction ventilation when building is substantially enclosed.

C. If extremely dusty or dirty work must be conducted inside the building, shut down HVAC systems for the duration; remove dust and dirt completely before restarting systems.

D. Use of HVAC equipment and ductwork for ventilation during construction is not permitted:
   1. Provide temporary ventilation equivalent to 1.5 air changes per hour, minimum.
   2. Exhaust directly to outside.
   3. Seal HVAC air inlets and outlets immediately after duct installation.

E. Do not store construction materials or waste in mechanical or electrical rooms.

F. Prior to use of return air ductwork without intake filters clean up and remove dust and debris generated by construction activities.
   1. Inspect duct intakes, return air grilles, and terminal units for dust.
   2. Clean plenum spaces, including top sides of lay-in ceilings, outsides of ducts, tops of pipes and conduit.
   3. Clean tops of doors and frames.
   4. Clean mechanical and electrical rooms, including tops of pipes, ducts, and conduit, equipment, and supports.
   5. Clean return plenums of air handling units.
   6. Remove intake filters last, after cleaning is complete.

G. Do not perform dusty or dirty work after starting use of return air ducts without intake filters.

H. Use other relevant recommendations of SMACNA (OCC) for avoiding unnecessary contamination due to construction procedures.

3.02 BUILDING FLUSH-OUT

A. Contractor's Option: Either full continuous flush-out OR satisfactory air contaminant testing is required, not both.

B. Perform building flush-out before occupancy.

C. Do not start flush-out until:
   1. All construction is complete.
   2. HVAC systems have been tested, adjusted, and balanced for proper operation.
   3. Inspection of inside of return air ducts and terminal units confirms that cleaning is not necessary.
   4. New HVAC filtration media have been installed.

D. Building Flush-Out: Operate all ventilation systems at normal flow rates with 100 percent outside air until a total air volume of 14,000 cubic feet per square foot of floor area has been supplied.
   1. Obtain City's concurrence that construction is complete enough before beginning flush-out.
   2. Maintain interior temperature of at least 60 degrees F and interior relative humidity no higher than 60 percent.
   3. If additional construction involving materials that produce particulates or any of the specified contaminants is conducted during flush-out, start flush-out over.
   4. If interior spaces must be occupied prior to completion of the flush-out, supply a minimum of 25 percent of the total air volume prior to occupancy, and:

a. Begin ventilation at least three hours prior to daily occupancy.
b. Continue ventilation during all occupied periods.
c. Provide minimum outside air volume of 0.30 cfm per square foot or design minimum outside air rate, whichever is greater.

E. Install new HVAC filtration media after completion of flush-out and before occupancy or further testing.

3.03 AIR CONTAMINANT TESTING

A. Contractor's Option: Either full continuous flush-out, or satisfactory air contaminant testing is required, not both.

B. Perform air contaminant testing before occupancy.

C. Do not start air contaminant testing until:
1. All construction is complete, including interior finishes.
2. HVAC systems have been tested, adjusted, and balanced for proper operation.
3. New HVAC filtration media have been installed.

D. Indoor Air Samples: Collect from spaces representative of occupied areas:
1. Collect samples while operable windows and exterior doors are closed, HVAC system is running normally as if occupied, with design minimum outdoor air, but with the building unoccupied.
2. Collect samples from spaces in each contiguous floor area in each air handler zone, but not less than one sample per 25,000 square feet; take samples from areas having the least ventilation and those having the greatest presumed source strength.
3. Collect samples from height from 36 inches to 72 inches above floor.
4. Collect samples from same locations on 3 consecutive days during normal business hours; average the results of each set of 3 samples.
5. Exception: Areas with normal very high outside air ventilation rates, such as laboratories, do not need to be tested.
6. When retesting the same building areas, take samples from at least the same locations as in first test.

E. Outdoor Air Samples: Collect samples at outside air intake of each air handler at the same time as indoor samples are taken.

F. Analyze air samples and submit report.

G. Air Contaminant Concentration Limits:
1. Formaldehyde: Not more than 27 parts per billion.
2. PM10 Particulates: Not more than 50 micrograms per cubic meter.
3. Total Volatile Organic Compounds (TVOCs): Not more than 500 micrograms per cubic meter.
4. Chemicals Listed in CAL (CDPH SM) Table 4-1, except Formaldehyde: Allowable concentrations listed in Table 4-1.
5. Carbon Monoxide: Not more than 9 parts per million and not more than 2 parts per million higher than outdoor air.

H. Air Contaminant Concentration Test Methods:
1. Formaldehyde: ASTM D5197, EPA 625/R-96/010b Method TO-11A, or EPA 600/4-90/010 Method IP-6.
2. Particulates: EPA 600/4-90/010 Method IP-10.
3. Total Volatile Organic Compounds (TVOC): EPA 625/R-96/010b Method TO-1, TO-15, or TO-17; or EPA 600/4-90/010 Method IP-1.
4. Chemicals Listed in CAL (CDPH SM) Table 4-1, except Formaldehyde: ASTM D5197, or EPA 625/R-96/010b Method TO-1, TO-15, or TO-17.
5. Carbon Monoxide: EPA 600/4-90/010 Method IP-3, plus measure outdoor air; measure in ppm; report both indoor and outdoor measurements.

3.04 VENTILATION EFFECTIVENESS TESTING

A. Perform ventilation effectiveness testing before occupancy.

B. Do not begin ventilation effectiveness testing until:
   1. HVAC testing, adjusting, and balancing has been satisfactorily completed.
   2. Building flush-out or air contaminant testing has been completed satisfactorily.
   3. New HVAC filtration media have been installed.

C. Test each air handler zone in accordance with ASHRAE Std 129.

D. If calculated air change effectiveness for a particular zone is less than 0.9 due to inadequate balancing of the system, adjust, and retest at no cost to City.

END OF SECTION 01 57 19

This page intentionally left blank

SECTION 01 58 13
TEMPORARY PROJECT SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Project identification sign.

1.02 RELATED REQUIREMENTS

A. Standard Specifications and Section - 00 72 13 Special Provisions: Additional requirements related to temporary project signage.

B. Section 01 10 00 - Summary: Responsibility to provide signs.

1.03 REFERENCE STANDARDS

A. FHWA (SHS) - Standard Highway Signs and Markings 2004, with Supplement (2012).

1.04 QUALITY ASSURANCE

A. Design sign and structure to withstand 50 miles/hr wind velocity.

B. Sign Painter: Experienced as a professional sign painter for minimum three years.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Shop Drawing: Show content, layout, lettering, color, foundation, structure, sizes and grades of members.

PART 2 PRODUCTS

2.01 SIGN MATERIALS

A. Structure and Framing: New, wood, structurally adequate.

B. Sign Surfaces: Exterior grade plywood with medium density overlay, minimum 3/4 inch thick, standard large sizes to minimize joints.

C. Rough Hardware: Galvanized.

D. Paint and Primers: Exterior quality, two coats; sign background of color as selected.

E. Lettering: Exterior quality paint, contrasting colors.

2.02 PROJECT IDENTIFICATION SIGN

A. One painted sign, 80 sq ft area, bottom 6 feet above ground, to be located as directed by City.

B. Content:

1. Project title, logo and name of City as indicated on Contract Documents.
2. Names and titles of authorities.
3. Names and titles of Architect and Consultants.
4. Name of Prime Contractor and major Subcontractors.
5. Other copy and graphic content as may be provided by City.

C. Graphic Design, Colors, Style of Lettering: Designated by Architect.

D. Lettering: Standard Alphabet Series C, as specified in FHWA (SHS).

PART 3 EXECUTION

3.01 INSTALLATION

A. Install project identification sign within 30 days after date fixed by Notice to Proceed.

B. Erect at prominent location visible from street, to be determined by Owner.

C. Erect supports and framing on secure foundation, rigidly braced and framed to resist wind loadings.

D. Install sign surface plumb and level, with butt joints. Anchor securely.

E. Paint exposed surfaces of sign, supports, and framing.

3.02 MAINTENANCE

A. Maintain signs and supports clean, repair deterioration and damage.

3.03 REMOVAL

A. Remove signs, framing, supports, and foundations at completion of Project and restore the area.

END OF SECTION 01 58 13

SECTION 01 60 00
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General product requirements.

B. Re-use of existing products.

C. Transportation, handling, storage and protection.

D. Product option requirements.

E. Substitution limitations.

F. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

A. Standard Specifications and Section - 00 72 13 Special Provisions: Additional requirements related to product requirements.

B. Section 01 25 00 - Substitution Procedures: Substitutions made during construction.

C. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions: Requirements for VOC-restricted product categories.

D. Section 01 74 19 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting product selection, packaging and substitutions.

1.03 SUBMITTALS

A. Proposed Products List: Submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
   1. Submit within 15 days after date of Agreement.
   2. For products specified only by reference standards, list applicable reference standards.

B. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

C. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

D. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
   1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

PART 2 PRODUCTS

2.01 EXISTING PRODUCTS

A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by Contract Documents.

B. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the City, or otherwise indicated as to remain the property of the City, become the property of the Contractor; remove from site.

2.02 NEW PRODUCTS

A. Provide new products unless specifically required or permitted by Contract Documents.

B. Use of products having any of the following characteristics is not permitted:
   1. Made using or containing CFC's or HCFC's.
   2. Made of wood from newly cut old growth timber.
   3. Containing lead, cadmium, or asbestos.

C. Where other criteria are met, Contractor shall give preference to products that:
   1. If used on interior, have lower emissions, as defined in Section 01 61 16.
   2. If wet-applied, have lower VOC content, as defined in Section 01 61 16.

2.03 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

D. Where a basis of design product and manufacturer is specified, other manufacturers are sometimes listed as "acceptable manufacturers" since they are known to produce similar types of product. This is neither a guarantee or assurance that these other "acceptable manufacturers" can actually provide an equal product. Instead, this list is provided for the convenience of the Contractor in finding acceptable alternative products, and it is the Contractor's responsibility to identify any equal products it may wish to submit for the review and approval by Architect and City to become an “approved equal”.

2.04 MAINTENANCE MATERIALS

A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.

B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION LIMITATIONS

A. See Section 01 25 00 - Substitution Procedures.

3.02 TRANSPORTATION AND HANDLING

A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.

B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.

C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

D. Transport and handle products in accordance with manufacturer's instructions.

E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.

F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.

H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.03 STORAGE AND PROTECTION

A. Provide protection of stored materials and products against theft, casualty, or deterioration.

B. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 01 74 19.
   1. Structural Loading Limitations: Handle and store products and materials so as not to exceed static and dynamic load-bearing capacities of project floor and roof areas.

C. Store and protect products in accordance with manufacturers' instructions.

D. Store with seals and labels intact and legible.

E. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.

F. For exterior storage of fabricated products, place on sloped supports above ground.

G. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.

H. Comply with manufacturer's warranty conditions, if any.

I. Do not store products directly on the ground.

J. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

K. Prevent contact with material that may cause corrosion, discoloration, or staining.

L. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

M. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION 01 60 00

This page intentionally left blank

SECTION 01 61 16
VOLATILE ORGANIC COMPOUND (VOC) CONTENT RESTRICTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Requirements for Indoor-Emissions-Restricted products.

B. Requirements for VOC-Content-Restricted products.

C. Requirement for installer certification that they did not use any non-compliant products.

1.02 RELATED REQUIREMENTS

A. Standard Specifications and Section - 00 72 13 Special Provisions: Additional requirements related to products, quality, protection of persons and property requirements.

B. Section 01 30 00 - Administrative Requirements: Submittal procedures.

C. Section 01 40 00 - Quality Requirements: Procedures for testing and certifications.

D. Section 01 57 19 - Temporary Environmental Controls: Procedures for pre-occupancy building ventilation.

E. Section 01 60 00 - Product Requirements: Fundamental product requirements, substitutions and product options, delivery, storage, and handling.

1.03 DEFINITIONS

A. Indoor-Emissions-Restricted Products: All products in the following product categories, whether specified or not:
   1. Interior paints and coatings applied on site.
   2. Interior adhesives and sealants applied on site, including flooring adhesives.
   3. Flooring.
   4. Composite wood.
   5. Products making up wall and ceiling assemblies.
   6. Thermal and acoustical insulation.

B. VOC-Content-Restricted Products: All products in the following product categories, whether specified or not:
   1. Interior paints and coatings applied on site.
   2. Interior adhesives and sealants applied on site, including flooring adhesives.
   3. Other products when specifically stated in the specifications.

C. Interior of Building: Anywhere inside the exterior weather barrier.

D. Adhesives: All gunnable, trowelable, liquid-applied, and aerosol adhesives, whether specified or not; including flooring adhesives, resilient base adhesives, and pipe jointing adhesives.

E. Sealants: All gunnable, trowelable, and liquid-applied joint sealants and sealant primers, whether specified or not; including firestopping sealants and duct joint sealers.

F. Inherently Non-Emitting Materials: Products composed wholly of minerals or metals, unless they include organic-based surface coatings, binders, or sealants; and specifically the following:
   1. Concrete.
   2. Clay brick.
   3. Metals that are plated, anodized, or powder-coated.
   4. Glass.
   5. Ceramics.
   6. Solid wood flooring that is unfinished and untreated.

1.04 REFERENCE STANDARDS

A. 2019 California Green Building Standards Code; CALGREEN CODE 5.504.4 - Finish Material Pollutant Control; 2020.

B. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency current edition.

C. ASTM D3960 - Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings 2005 (Reapproved 2018).

D. BIFMA e3 - Furniture Sustainability Standard; Business and Institutional Furniture Manufacturers Association 2019.

E. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions From Indoor Sources Using Environmental Chambers 2017, v1.2.

F. CARB (ATCM) - Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products; California Air Resources Board current edition.

G. CARB (SCM) - Suggested Control Measure for Architectural Coatings; California Air Resources Board 2007.

H. CHPS (HPPD) - High Performance Products Database Current Edition at www.chps.net/.

I. CRI (GLP) - Green Label Plus Testing Program - Certified Products Current Edition.

J. SCAQMD 1113 - Architectural Coatings 1977 (Amended 2016).

K. SCAQMD 1168 - Adhesive and Sealant Applications 1989 (Amended 2017).

L. SCS (CPD) - SCS Certified Products Current Edition.

M. UL (GGG) - GREENGUARD Gold Certified Products Current Edition.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: For each VOC-restricted product used in the project, submit evidence of compliance.

C. Sustainable Design Reporting: Submit evidence of compliance with project submittal guidelines for 2019 California Green Building Standards Code.

D. Installer Certifications Regarding Prohibited Content: Require each installer of any type of product (not just the products for which VOC restrictions are specified) to certify that either 1) no adhesives, joint sealants, paints, coatings, or composite wood or agrifiber products have been used in the installation of installer's products, or 2) that such products used comply with these requirements.

1.06 QUALITY ASSURANCE

A. Indoor Emissions Standard and Test Method: CAL (CDPH SM), using Standard Private Office exposure scenario and the allowable concentrations specified in the method, and range of total VOC's after 14 days.
   1. Wet-Applied Products: State amount applied in mass per surface area.
   2. Paints and Coatings: Test tinted products, not just tinting bases.
   3. Evidence of Compliance: Acceptable types of evidence are the following;
      a. Current UL (GGG) certification.
      b. Current SCS (CPD) Floorscore certification.
      c. Current SCS (CPD) Indoor Advantage Gold certification.
      d. Current listing in CHPS (HPPD) as a low-emitting product.
      e. Current CRI (GLP) certification.
      f. Test report showing compliance and stating exposure scenario used.
   4. Product data submittal showing VOC content is NOT acceptable evidence.
   5. Manufacturer's certification without test report by independent agency is NOT acceptable evidence.

B. VOC Content Test Method: 40 CFR 59, Subpart D (EPA Method 24), or ASTM D3960, unless otherwise indicated.
   1. Evidence of Compliance: Acceptable types of evidence are:

a. Report of laboratory testing performed in accordance with requirements.

C. Composite Wood Emissions Standard: CARB (ATCM) for ultra-low emitting formaldehyde (ULEF) resins.
1. Evidence of Compliance: Acceptable types of evidence are:
a. Current SCS "No Added Formaldehyde (NAF)" certification; www.scscertified.com.
b. Report of laboratory testing performed in accordance with requirements.
c. Published product data showing compliance with requirements.

D. Furnishings Emissions Standard and Test Method: BIFMA e3 Sections 7.6.1 and 7.6.2, tested in accordance with BIFMA M7.1.
1. Evidence of Compliance:
a. Test report showing compliance and stating exposure scenario used.

E. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

PART 2 PRODUCTS

2.01 MATERIALS

A. All Products: Comply with the most stringent of federal, State, and local requirements, or these specifications.

B. VOC-Content-Restricted Products: VOC content not greater than required by the following:
1. Adhesives, Including Flooring Adhesives: SCAQMD 1168 Rule and CALGREEN 5.504.4.1.
2. Joint Sealants: SCAQMD 1168 Rule and CALGREEN 5.504.4.1.
3. Paints and Coatings: Each color; most stringent of the following:
a. 40 CFR 59, Subpart D.
b. SCAQMD 1113 Rule.
c. CARB (SCM).
d. CALGREEN 5.504.4.3.
4. Carpet Systems: All carpet installed in the building interior shall meet the following:
a. CALGREEN 5.504.4.4.
5. Composite Wood Products: Hardwood plywood, particleboard, and medium densityfiberboard composite wood products used on the interior or exterior of the building shall meet the following:
a. CALGREEN 5.504.4.5.
6. Resilient Flooring Systems: Installed resilient flooring shall meet the following:
a. CALGREEN 5.504.4.6.

PART 3 EXECUTION

3.01 FIELD QUALITY CONTROL

A. City reserves the right to reject non-compliant products, whether installed or not, and require their removal and replacement with compliant products at no extra cost to City.

B. Additional costs to restore indoor air quality due to installation of non-compliant products will be borne by Contractor.

END OF SECTION 01 61 16

This page intentionally left blank

SECTION 01 70 00
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Examination, preparation, and general installation procedures.

B. Requirements for alterations work, including selective demolition.

C. Pre-installation meetings.

D. Cutting and patching.

E. Surveying for laying out the work and at completion.

F. Cleaning and protection.

G. Starting of systems and equipment.

H. Demonstration and instruction of City personnel.

I. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.

J. General requirements for maintenance service.

1.02 RELATED REQUIREMENTS

A. Standard Specifications and Section - 00 72 13 Special Provisions: Additional requirements related to administrative requirements and procedures.

B. Section 01 21 00 - Allowances: allowances for applied fire protection to existing structure; for scanning of existing post-tensioned slabs; and final cleaning pressure washing of the entire exterior building envelope.

C. Section 01 30 00 - Administrative Requirements: Submittals procedures, Electronic document submittal service.

D. Section 01 40 00 - Quality Requirements: Testing and inspection procedures.

E. Section 01 50 00 - Temporary Facilities and Controls: Temporary exterior enclosures.

F. Section 01 51 00 - Temporary Utilities: Temporary heating, cooling, and ventilating facilities.

G. Section 01 71 23 - Field Engineering: Additional requirements for field engineering and surveying work.

H. Section 01 78 00 - Closeout Submittals: Project record documents, operation and maintenance data, warranties, and bonds.

I. Section 01 79 00 - Demonstration and Training: Demonstration of products and systems to be commissioned and where indicated in specific specification sections

J. Section 01 91 00 - General Commissioning Requirements: Contractor's responsibilities in regard to commissioning.

K. Section 02 41 00 - Demolition: Demolition of whole structures and parts thereof; site utility demolition.

L. Section 07 84 00 - Firestopping.

M. Individual Product Specification Sections:
   1. Advance notification to other sections of openings required in work of those sections.
   2. Limitations on cutting structural members.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.

1. On request, submit documentation verifying accuracy of survey work.
2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in compliance with Contract Documents.
3. Submit surveys and survey logs for the project record.

C. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
1. Structural integrity of any element of Project.
   a. A submittal plan is required for any coring of attachment to the existing post-tensioned reinforced concrete slabs require scanning to confirm that no damage will occur to existing post-tensioning strands or reinforcement. Refer to structural drawings, 02 41 00 - Demolition, and 01 21 00 - Allowances.
2. Integrity of weather exposed or moisture resistant element.
3. Efficiency, maintenance, or safety of any operational element.
4. Visual qualities of sight exposed elements.
5. Work of City or separate Contractor.

D. Project Record Documents: Accurately record actual locations of capped and active utilities.

1.04 QUALIFICATIONS

A. For demolition work, employ a firm specializing in the type of work required.
1. Minimum of 10 years of documented experience.

B. For surveying work, employ a land surveyor registered in the State of Californiaand acceptable to Architect. Submit evidence of surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate. Employ only individual(s) trained and experienced in collecting and recording accurate data relevant to ongoing construction activities,

C. For field engineering, employ a professional engineer of the discipline required for specific service on Project, licensed in the State of California. Employ only individual(s) trained and experienced in establishing and maintaining horizontal and vertical control points necessary for laying out construction work on project of similar size, scope and/or complexity.

D. For design of temporary shoring and bracing, employ a Professional Engineer experienced in design of this type of work and licensed in the State of California.

E. For scanning including GPR, X-ray, and other NDI, employ a firm with at least 10 years of successful experience in this work and licensed in the State of California.

1.05 PROJECT CONDITIONS

A. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

B. Perform dewatering activities, as required, for the duration of the project.

C. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

D. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.

E. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
1. Outdoors: Limit conduct of especially noisy exterior work to the hours of 7 am to 5 pm..

F. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.

G. Rodent Control: Provide methods, means, and facilities to prevent rodents from accessing or invading premises.

H. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

1.06 COORDINATION

A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

B. Notify affected utility companies and comply with their requirements.

C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

F. Coordinate completion and clean-up of work of separate sections.

G. After City occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of City's activities.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

A. New Materials: As specified in product sections; match existing products and work for patching and extending work.

B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.

C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.

E. Verify that utility services are available, of the correct characteristics, and in the correct locations.

F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work including identification of existing cracks in the existing post-tensioned reinforced concrete slabs. Beginning of cutting or patching means acceptance of existing conditions.

G. Monitor any additional cracking which may occur as the Work progresses, report any to owner's representative promptly.

3.02 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 PREINSTALLATION MEETINGS

A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.

B. Require attendance of parties directly affecting, or affected by, work of the specific section.

C. Notify Architect four days in advance of meeting date.

D. Prepare agenda and preside at meeting:
   1. Review conditions of examination, preparation and installation procedures.
   2. Review coordination with related work.

E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, City, participants, and those affected by decisions made.

3.04 LAYING OUT THE WORK

A. Verify locations of survey control points prior to starting work.

B. Promptly notify Architect of any discrepancies discovered.

C. Contractor shall locate and protect survey control and reference points.

D. Control datum for survey is that established by City provided survey.

E. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

F. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.

G. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.

H. Utilize recognized engineering survey practices.

I. Establish a minimum of two permanent bench marks on site, referenced to established control points. Record locations, with horizontal and vertical data, on project record documents.

J. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
   1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
   2. Grid or axis for structures.
   3. Building foundation, column locations, ground floor elevations.

K. Periodically verify layouts by same means.

L. Maintain a complete and accurate log of control and survey work as it progresses.

M. Special attention is brought to the need for the Contractor to layout the work, identify areas requiring coring and scanning of the existing concrete walls and floors, and the need to relayout the work as-necessary to accommodate any relocated penetrations based on scanning results and for the approval of owner.

N. On completion of foundation walls and major site improvements, prepare a certified survey illustrating dimensions, locations, angles, and elevations of construction and site work.

3.05 GENERAL INSTALLATION REQUIREMENTS

A. In addition to compliance with regulatory requirements, conduct construction operations in compliance with NFPA 241, including applicable recommendations in Appendix A.

B. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.

C. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

D. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

E. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

F. Make neat transitions between different surfaces, maintaining texture and appearance.

G. Where adjacent flooring conditions are found to vary from existing, provision of transition strips and/or thresholds is the responsibility of the contractor to provide and install.

3.06 ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
   1. Verify that construction and utility arrangements are as indicated.
   2. Report discrepancies to Architect before disturbing existing installation.
   3. Beginning of alterations work constitutes acceptance of existing conditions.

B. Remove existing work as indicated and as required to accomplish new work.
   1. Remove items indicated on drawings.
   2. Relocate items indicated on drawings.
   3. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
   4. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.

C. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove, relocate, and extend existing systems to accommodate new construction.
   1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
   2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
   3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
      a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
      b. Provide temporary connections as required to maintain existing systems in service.
   4. Verify that abandoned services serve only abandoned facilities.
   5. Remove abandoned pipe, ducts, conduits, and equipment , including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.

D. Protect existing work to remain.
   1. Prevent movement of structure; provide shoring and bracing if necessary.
   2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
   3. Repair adjacent construction and finishes damaged during removal work.

E. Adapt existing work to fit new work: Make as neat and smooth transition as possible.

F. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.

G. Refinish existing surfaces as indicated:

1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.
2. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.

H. Clean existing systems and equipment.

I. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.

J. Do not begin new construction in alterations areas before demolition is complete.

K. Comply with all other applicable requirements of this section.

3.07 CUTTING AND PATCHING

A. Whenever possible, execute the work by methods that avoid cutting or patching.

B. At existing post-tensioning slabs, use all existing openings and points of support fully before identifying where new openings or points of support are required. Scan these areas to confirm no impact to existing post-tensioning strand cables and other reinforcement before proceeding.

C. See Alterations article above for additional requirements.

D. Perform whatever cutting and patching is necessary to:
1. Complete the work.
2. Fit products together to integrate with other work.
3. Provide openings for penetration of mechanical, electrical, and other services.
4. Match work that has been cut to adjacent work.
5. Repair areas adjacent to cuts to required condition.
6. Repair new work damaged by subsequent work.
7. Remove samples of installed work for testing when requested.
8. Remove and replace defective and non-complying work.

E. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.

F. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

G. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

H. Restore work with new products in accordance with requirements of Contract Documents.

I. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

J. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 84 00, to full thickness of the penetrated element.

K. Patching:
1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
2. Match color, texture, and appearance.
3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.08 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.09 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

B. Provide special protection where specified in individual specification sections.

C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

G. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.10 SYSTEM STARTUP

A. Coordinate schedule for start-up of various equipment and systems.

B. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.

C. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

D. Verify that wiring and support components for equipment are complete and tested.

E. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.

F. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.11 DEMONSTRATION AND INSTRUCTION

A. See Section 01 79 00 - Demonstration and Training.

3.12 ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

3.13 FINAL CLEANING

A. Use cleaning materials that are nonhazardous.

B. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

C. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.

D. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

E. Clean filters of operating equipment.

F. Clean debris from overflow drains and area drains.

G. Clean site; sweep paved areas, rake clean landscaped surfaces.

H. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

I. Conduct final cleaning inclusive of complete pressure washing of the entire exterior building envelope including but not limited to concrete, exterior insulation and finish system EIFS, curtain wall assembly, curtain wall glazing, storefront windows and glazing, doors, windows, metal trim and flashing, and joinery. Stairway penthouse structures at the roof and the roof itself are included.

3.14 CLOSEOUT PROCEDURES

A. Make submittals that are required by governing or other authorities.

B. Accompany Project Coordinator on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Notice of Substantial Completion.

C. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.

D. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Substantial Completion inspection.

E. Conduct Substantial Completion inspection and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.

F. Correct items of work listed in Final Correction Punch List and comply with requirements for access to City-occupied areas.

G. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.

H. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

3.15 MAINTENANCE

A. Provide service and maintenance of components indicated in specification sections.

B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.

C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.

D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.

E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the City.

END OF SECTION 01 70 00

SECTION 01 71 23
FIELD ENGINEERING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Field engineering services by Contractor.

B. Land surveying services by Contractor.

1.02 RELATED REQUIREMENTS

A. Standard Specifications and Section - 00 72 13 Special Provisions: Additional requirements related to contractor responsibilities.

B. Section 01 70 00 - Execution and Closeout Requirements: additional requirements related to field engineering.

1.03 DESCRIPTION OF SERVICES

A. Specific services listed in this section are in addition to, and do not supersede, general Execution and Closeout Requirements.

B. Sole responsibility for establishing all locations, dimensions and levels of items of work.

C. Sole responsibility for provision of all materials required to establish and maintain benchmarks and control points, including batter boards, grade stakes, structure elevation stakes, and other items.

D. Keeping a transit, theodolite, or TST (total station theodolite with electronic distance measurement device); leveling instrument; and related implements such as survey rods and other measurement devices, at the project site at all times.

E. Provision of facilities and assistance necessary for Architect to check lines and grade points placed by Contractor.
   1. Performance of excavation or embankment work until after all cross-sectioning necessary for determining payment quantities for Unit Price work have been completed and accepted by Architect.

F. Preparation and maintenance of daily reports of activity on the work. Submission of reports containing key progress indicators and job conditions to Architect.
   1. Major equipment and materials installed as part of the work.
   2. Location of areas in which construction was performed.
   3. Work performed, including field quality control measures and testing.
   4. Weather conditions.
   5. Instructions received from Architect or City, if any.

G. Preparation and maintenance of professional-quality, accurate, well organized, legible notes of all measurements and calculations made while surveying and laying out the work.

1.04 REFERENCE STANDARDS

A. FGDC-STD-007.1 - Geospatial Positioning Accuracy Standards - Part 1: Reporting Methodology 1998.

B. FGDC-STD-007.2 - Geospatial Positioning Accuracy Standards - Part 2: Standards for Geodetic Networks 1998.

C. FGDC-STD-007.4 - Geospatial Positioning Accuracy Standards - Part 4: Architecture, Engineering, Construction, and Facilities Measurement 2002.

D. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems 2008.

E. State Plane Coordinate System for the State in which the Project is located.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Submit in addition to items required in Section 01 70 00 - Execution and Closeout Requirements.

C. Informational Submittals: Submit the following:
   1. Field Engineering: Submit daily reports, with content as indicated in this section.
      a. When requested by Architect, submit for Record documentation verifying accuracy of field engineering including, but not limited to, Contractor's survey notes and field notes.
   2. Final property survey.

1.06 QUALITY ASSURANCE

A. Field Engineer's Qualifications: As established in Section 01 70 00 - Execution and Closeout Requirements.

B. Minimum accuracy for required work is as follows:
   1. Grade: Horizontal Tolerance: Plus or minus 0.5 feet, Vertical Tolerance: Plus or minus 0.05 feet.
   2. Culverts and ditches: Horizontal Tolerance: Plus or minus 0.5 feet, Vertical Tolerance: Plus or minus 0.05 feet.
   3. Structures: Horizontal Tolerance: Plus or minus 0.5 feet (location), Vertical Tolerance: Plus or minus 0.05 feet.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 FIELD ENGINEERING

A. Maintain field office files, drawings, specifications, and record documents.

B. Coordinate field engineering services with Contractor's subcontractors, installers, and suppliers as appropriate.

C. Prepare layout and coordination drawings for construction operations.

D. Check and coordinate the work for conflicts and interferences, and immediately advise Architect and City of all discrepancies of which Contractor is aware.

E. Cooperate as required with Architect and City in observing the work and performing field inspections.

F. Review and coordinate work on a regular basis with shop drawings and Contractor's other submittals.

G. Check the location, line and grade of every major element as the work progresses. Notify the Architect when deviations from required lines or grades exceed allowable tolerances. Include in such notifications a thorough explanation of the problem, and a proposed plan and schedule for remedying the deviation. Do not proceed with remedial work without City's concurrence of the remediation plan.

3.02 LAND SURVEYING

A. General: Follow standards for geospatial positioning accuracy.
   1. FGDC-STD-007.1 as amended by Authority Having Jurisdiction.
   2. FGDC-STD-007.2 as amended by Authority Having Jurisdiction.
   3. FGDC-STD-007.4 as amended by Authority Having Jurisdiction.

B. Coordinate survey data with the State Plane Coordinate System of the State in which the Project is located.

C. Contractor is responsible for the restoration of all property corners and control monuments damaged or destroyed by construction-related activities. Any disturbed monuments must be replaced at Contractor's expense by a surveyor licensed in the State of California, and approved by the Architect.

1. Temporarily suspend work at such points and for such reasonable times as the City may require for resetting monuments. The Contractor will not be entitled to any additional compensation or extension of time.

3.03 CONSTRUCTION SURVEYING

A. General: Perform surveying as applicable to specific items necessary for proper execution of work.
   1. Alignment Staking: Provide alignment stakes at 50 foot intervals on tangent, and at 25 foot intervals on curves.
   2. Slope Staking: Provide slope staking at 50 foot intervals on tangent, and at 25 foot intervals on curves. Re-stake at every ten-foot difference in elevation.
   3. Structure: Stake out structures, including elevations, and check prior to and during construction.
   4. Pipelines: Stake out pipelines including elevations, and check prior to and during construction.
   5. Site Utilities: Stake out utility lines including elevations, and check prior to and during construction.
   6. Road: Stake out roadway elevations at 50 foot50-foot intervals on tangent, and at 25 foot intervals on curves.
   7. Record Staking: Provide permanent stake at each blind flange and each utility cap is provided for future connections. Use stakes for record staking of material(s) acceptable to Architect.

B. Record Log: Maintain a log of layout control work. Record any deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used.

C. Accuracy:
   1. Establish Contractor's temporary survey references points for Contractor’s use to at least second-order accuracy (e.g., 1:10000). Set construction staking used as a guide for the work to at least third-order accuracy (e.g., 1:5000). Provide the absolute margin for error specified below on the basis established by such orders.
      a. Accuracy of other staking shall be plus or minus 0.04 feet horizontally and plus or minus 0.02 feet vertically.
      b. Include an error analysis sufficient to demonstrate required accuracy in survey calculations.
   2. City reserves the right to check the Contractor's survey, measurements, and calculations. The requirement for accuracy will not be waived, whether this right is exercised or not.

3.04 SUPPORT AND BRACING

A. General requirements: Design all support and bracing systems, if required. Provide for attachment to portions of the building structure capable of bearing the loads imposed. Design systems to not overstress the building structure.

B. Seismic Bracing: Design where required by authorities having jurisdiction.
   1. Design and install all support systems to comply with the seismic requirements of the Construction Code of the State of California.
   2. Design and install seismic bracing so as not to defeat the operation on any required vibration isolation or sound isolation devices.
   3. For seismic bracing guidelines for mechanical, electrical and plumbing systems, refer to SMACNA (SRM).

3.05 REPORTS

A. Submit two copies of Contractor’s daily reports at Architect’s field office (or electronically) by 9:00 AM the next working day after the day covered in the associated report. Daily report shall be signed by responsible member of Contractor’s staff, such as project manager or superintendent, or foreman designated by Contractor as having authority to sign daily reports.

3.06 RECORDS

A. Maintain at the Site a complete and accurate log of control and survey work as it progresses.
   1. Organize and record survey data in accordance with recognized professional surveying standards, Laws and Regulations, and prevailing standards of practice in the State of California. Record Contractor's surveyor's original field notes, computations, and other surveying data in Contractor-furnished hard-bound field books. Contractor is solely responsible for completeness and accuracy of survey work, and completeness and accuracy of survey records, including field books. Survey records,(including field books) may be rejected by City due to failure to organize and maintain survey records in a manner that allows reasonable and independent verification of calculations, and/or allows identification of elevations, dimensions, and grades of the work.
   2. Illegible notes or data, and erasures on any page of field books, are unacceptable. Do not submit copied notes or data. Corrections by ruling or lining out errors will be unacceptable unless initialed by the surveyor. Violation of these requirements may require re-surveying the data questioned by Architect.

B. Submit three copies of final property survey to City. Include on the survey a certification, signed by the surveyor, that principal metes, bounds, lines, and levels of the Project are accurately positioned as shown on the survey. Include the following information:
   1. Structure locations from property lines, and distances to adjacent buildings.
   2. Dimensions and locations of drives, walks, walls, underground utilities, appurtenances, and major site features.
   3. Location of easements.
   4. Final grading topographic survey.

3.07 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

B. See Section 01 79 00 - Demonstration and Training, for additional requirements.

END OF SECTION 01 71 23

SECTION 01 74 19
CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.01 WASTE MANAGEMENT REQUIREMENTS

A. City requires that this project generate the least amount of trash and waste possible.

B. 2019 CalGreen Mandatory Measure: Construction Waste Reduction, Disposal and Recyling.
   1. Recycle and/or salvage for reuse a minimum of 65 percent of the nonhazardous construction and demolition waste in accordance with Section 5.108.1.1, 5.408.1.2 or 5.408.1.3; or meet a local construction and demolition waste management ordinance, whichever is more stringent.

C. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.

D. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.

E. City may decide to pay for additional recycling, salvage, and/or reuse based on Landfill Alternatives Proposal specified below.

F. Required Recycling, Salvage, and Reuse: The following may not be disposed of in landfills or by incineration:
   1. Aluminum and plastic beverage containers.
   2. Corrugated cardboard.
   3. Wood pallets.
   4. Clean dimensional wood.
   5. Land clearing debris, including brush, branches, logs, and stumps; see Section 31 10 00 - Site Clearing for use options.
   6. Metals, including packaging banding, metal studs, sheet metal, structural steel, piping, reinforcing bars, door frames, and other items made of steel, iron, galvanized steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.
   7. Carpet, carpet cushion, carpet tile, and carpet remnants, both new and removed: DuPont (http://flooring.dupont.com) and Interface (www.interfaceinc.com) conduct reclamation programs.

G. Contractor shall submit periodic Waste Disposal Reports; all landfill disposal, recycling, salvage, and reuse must be reported regardless of to whom the cost or savings accrues; use the same units of measure on all reports.

H. Contractor shall develop and follow a Waste Management Plan designed to implement these requirements.

I. The following sources may be useful in developing the Waste Management Plan:

J. Methods of trash/waste disposal that are not acceptable are:
   1. Burning on the project site.
   2. Burying on the project site.
   3. Dumping or burying on other property, public or private.
   4. Other illegal dumping or burying.

K. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

L. In addition to the requirements of this section, follow all premit requirements for waste management.

1.02 RELATED REQUIREMENTS

A. 2019 California Green Building Standards Code: Section 5.408 Construction Waste Reduction, Disposal and Recycling.

B. Standard Specifications and Section - 00 72 13 Special Provisions: Additional requirements related to contractor responsibilities.

C. Section 01 01 00 - Summary of Work Envoironmentall Regulated Mateirals Abatement: Requirements related to the handling of hazardous materials to be removed.

D. Section 01 30 00 - Administrative Requirements: Additional requirements for project meetings, reports, submittal procedures, and project documentation.

E. Section 01 50 00 - Temporary Facilities and Controls: Additional requirements related to trash/waste collection and removal facilities and services.

F. Section 01 60 00 - Product Requirements: Waste prevention requirements related to delivery, storage, and handling.

G. Section 01 70 00 - Execution and Closeout Requirements: Trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

H. Section 02 41 00 - Demolition: Requirements related to the handling of existing materials to be demolished.

I. Section 02 41 13 - Selective Site Demolition: Requirements related to the handling of existing materials to be demolished.

1.03 DEFINITIONS

A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.

B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.

C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.

D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.

E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.

F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.

G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.

H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

I. Return: To give back reusable items or unused products to vendors for credit.

J. Reuse: To reuse a construction waste material in some manner on the project site.

K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.

L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.

M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.

N. Toxic: Poisonous to humans either immediately or after a long period of exposure.

O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.

P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. See Calgreen Section 5.408 for documentation requirements.

C. Landfill Alternatives Proposal: Within 10 calendar days after receipt of Notice of Award of Bid, or prior to any trash or waste removal, whichever occurs sooner, submit a projection of trash/waste that will require disposal and alternatives to landfilling, with net costs.
   1. Submit to Architect for City's review and approval.
   2. If City wishes to implement any cost alternatives, the Contract Price will be adjusted as specified elsewhere.
   3. Include an analysis of trash/waste to be generated and landfill options as specified for Waste Management Plan described below.
   4. Describe as many alternatives to landfilling as possible:
      a. List each material proposed to be salvaged, reused, or recycled.
      b. List the proposed local market for each material.
      c. State the estimated net cost resulting from each alternative, after subtracting revenue from sale of recycled or salvaged materials and landfill tipping fees saved due to diversion of materials from the landfill.
   5. Provide alternatives to landfilling for at least the following materials:
      a. Aluminum and plastic beverage containers.
      b. Corrugated cardboard.
      c. Wood pallets.
      d. Clean dimensional wood.
      e. Land clearing debris, including brush, branches, logs, and stumps.
      f. Concrete.
      g. Bricks.
      h. Concrete masonry units.
      i. Asphalt paving.
      j. Metals, including packaging banding, metal studs, sheet metal, structural steel, piping, reinforcing bars, door frames, and other items made of steel, iron, galvanized steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.
      k. Glass.
      l. Carpet, carpet cushion, carpet tile, and carpet remnants, both new and removed: DuPont (http://flooring.dupont.com) and Interface (www.interfaceinc.com) conduct reclamation programs.
      m. Fluorescent lamps (light bulbs).
      n. Acoustical ceiling tile and panels.

D. Once City has determined which of the landfill alternatives addressed in the Proposal above are acceptable, prepare and submit Waste Management Plan; submit within 10 calendar days after notification by Architect.

E. Waste Management Plan: Include the following information:
   1. Analysis of the trash and waste projected to be generated during the entire project construction cycle, including types and quantities.
   2. Landfill Options: The name, address, and telephone number of the landfill(s) where trash/waste will be disposed of, the applicable landfill tipping fee(s), and the projected cost of disposing of all project trash/waste in the landfill(s).
   3. Landfill Alternatives: List all waste materials that will be diverted from landfills by reuse, salvage, or recycling.
   4. Meetings: Describe regular meetings to be held to address waste prevention, reduction, recycling, salvage, reuse, and disposal.
   5. Materials Handling Procedures: Describe the means by which materials to be diverted from landfills will be protected from contamination and prepared for acceptance by designated facilities; include separation procedures for recyclables, storage, and

packaging.

6. Transportation: Identify the destination and means of transportation of materials to be recycled; i.e. whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler.

F. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.
   1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.
   2. Submit Report on a form acceptable to City.
   3. Landfill Disposal: Include the following information:
      a. Identification of material.
      b. Amount, in tons or cubic yards, of trash/waste material from the project disposed of in landfills.
      c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
      d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
   4. Incinerator Disposal: Include the following information:
      a. Identification of material.
      b. Amount, in tons or cubic yards, of trash/waste material from the project delivered to incinerators.
      c. State the identity of incinerators, total amount of fees paid to incinerator, and total disposal cost.
      d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
   5. Recycled and Salvaged Materials: Include the following information for each:
      a. Identification of material, including those retrieved by installer for use on other projects.
      b. Amount, in tons or cubic yards, date removed from the project site, and receiving party.
      c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.
      d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
      e. Certification by receiving party that materials will not be disposed of in landfills or by incineration.
   6. Material Reused on Project: Include the following information for each:
      a. Identification of material and how it was used in the project.
      b. Amount, in tons or cubic yards.
      c. Include weight tickets as evidence of quantity.
   7. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.

PART 2 PRODUCTS

2.01 PRODUCT SUBSTITUTIONS

A. See Section 01 60 00 - Product Requirements for substitution submission procedures.

B. For each proposed product substitution, submit the following information in addition to requirements specified in Section 01 60 00:
   1. Relative amount of waste produced, compared to specified product.
   2. Cost savings on waste disposal, compared to specified product, to be deducted from the Contract Price.
   3. Proposed disposal method for waste product.
   4. Markets for recycled waste product.

PART 3 EXECUTION

3.01 WASTE MANAGEMENT PROCEDURES

A. See Section 01 30 00 for additional requirements for project meetings, reports, submittal procedures, and project documentation.

B. See Section 01 50 00 for additional requirements related to trash/waste collection and removal facilities and services.

C. See Section 01 60 00 for waste prevention requirements related to delivery, storage, and handling.

D. See Section 01 70 00 for trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

3.02 WASTE MANAGEMENT PLAN IMPLEMENTATION

A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.

B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, City, and Architect.

C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.

D. Meetings: Discuss trash/waste management goals and issues at project meetings.
   1. Prebid meeting.
   2. Preconstruction meeting.
   3. Regular job-site meetings.

E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
   1. Provide containers as required.
   2. Provide temporary enclosures around piles of separated materials to be recycled or salvaged.
   3. Provide materials for barriers and enclosures that are nonhazardous, recyclable, or reusable to the maximum extent possible; reuse project construction waste materials if possible.
   4. Locate enclosures out of the way of construction traffic.
   5. Provide adequate space for pick-up and delivery and convenience to subcontractors.
   6. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.

F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.

G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.

H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.

I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION 01 74 19

This page intentionally left blank

SECTION 01 78 00
CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Project record documents.

B. Operation and maintenance data.

C. Warranties and bonds.

1.02 RELATED REQUIREMENTS

A. Standard Specifications and Section - 00 72 13 Special Provisions: Performance bond and labor and material payment bonds, warranty, and correction of work.

B. Section 01 30 00 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.

C. Section 01 70 00 - Execution and Closeout Requirements: Contract closeout procedures.

D.

E. Individual Product Sections: Specific requirements for operation and maintenance data.

F. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS

A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.

B. Operation and Maintenance Data:
   1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect will review draft and return one copy with comments.
   2. For equipment, or component parts of equipment put into service during construction and operated by City, submit completed documents within ten days after acceptance.
   3. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
   4. Submit two sets of revised final documents in final form within 10 days after final inspection.

C. Warranties and Bonds:
   1. For equipment or component parts of equipment put into service during construction with City's permission, submit documents within 10 days after acceptance.
   2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
   3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the Work:
   1. Drawings.
   2. Specifications.
   3. Addenda.
   4. Change Orders and other modifications to the Contract.
   5. Reviewed shop drawings, product data, and samples.

B. Ensure entries are complete and accurate, enabling future reference by City.

C. Keep jobsite plans up to date with all revisions made in the field.

D. Store record documents separate from documents used for construction.

E. Record information concurrent with construction progress.

F. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
   1. Changes made by Addenda and modifications.

G. Record Drawingsand Shop Drawings: Legibly mark each item to record actual construction including:
   1. Field changes of dimension and detail.
   2. Details not on original Contract drawings.

H. Final set of red-lined record drawings at end of project must show all changes by field order, ASI, and other documented changes, also any changes made in the field.

3.02 OPERATION AND MAINTENANCE DATA

A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

A. For Each Product, Applied Material, and Finish:
   1. Product data, with catalog number, size, composition, and color and texture designations.
   2. Information for re-ordering custom manufactured products.

B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.

C. Additional information as specified in individual product specification sections.

D. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

A. For Each Item of Equipment and Each System:
   1. Description of unit or system, and component parts.
   2. Identify function, normal operating characteristics, and limiting conditions.
   3. Include performance curves, with engineering data and tests.
   4. Complete nomenclature and model number of replaceable parts.
   5. Recommend availalbe vendor that can supply replacement part(s).
   6. Provide warranty manufacturer support information/phone number.

B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

C. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed or by label machine.

D. Include color coded wiring diagrams as installed.

E. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

F. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
   1. Include HVAC outdoor and exhaust air damper calibration strategy.
      a. Include provisions which ensure that full closure of dampers can be achieved.

G. Provide servicing and lubrication schedule, and list of lubricants required.

H. Include manufacturer's printed operation and maintenance instructions.

I. Include sequence of operation by controls manufacturer.

J. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

K. Provide control diagrams by controls manufacturer as installed.

L. Provide Contractor's coordination drawings, with color coded piping diagrams as installed.

M. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

N. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

O. Include test and balancing reports.

P. Additional Requirements: As specified in individual product specification sections.

3.05 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

A. Assemble operation and maintenance data into durable manuals for City's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.

B. Where systems involve more than one specification section, provide separate tabbed divider for each system.

C. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.

D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.

E. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.

F. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.

G. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.

H. Text: Manufacturer's printed data, or typewritten data on 20 pound paper.

I. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

J. Arrangement of Contents: Organize each volume in parts as follows:
   1. Project Directory.
   2. Table of Contents, of all volumes, and of this volume.
   3. Operation and Maintenance Data: Arranged by system, then by product category.
      a. Source data.

b. Operation and maintenance data.
c. Field quality control data.
d. Photocopies of warranties and bonds.

3.06 WARRANTIES AND BONDS

A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with City's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.

B. Verify that documents are in proper form, contain full information, and are notarized.

C. Co-execute submittals when required.

D. Retain warranties and bonds until time specified for submittal.

E. Manual: Bind in commercial quality 8-1/2 by 11 inch three D side ring binders with durable plastic covers.

F. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.

G. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.

H. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

END OF SECTION 01 78 00

SECTION 01 79 00
DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.01 SUMMARY

A. Demonstration of products and systems where indicated in specific specification sections.

B. Training of City personnel in operation and maintenance is required for:
   1. All software-operated systems, including but not limited to the following:
      a. Security System software.
      b. Building Management System software.
      c. Site Irrigation software.
   2. HVAC systems and equipment.
   3. Plumbing equipment.
   4. Electrical systems and equipment.
   5. Conveying systems.
   6. Landscape irrigation.
   7. Items specified in individual product Sections.

C. Training of City personnel in care, cleaning, maintenance, and repair is required for:
   1. Roofing, waterproofing, and other weather-exposed or moisture protection products.
   2. Finishes, including flooring, wall finishes, ceiling finishes.
   3. Items specified in individual product Sections.

1.02 RELATED REQUIREMENTS

A. Standard Specifications and Section - 00 72 13 Special Provisions: Additional requirements related to contractor responsibilities and closeout procedures.

B. Section 01 78 00 - Closeout Submittals: Operation and maintenance manuals.

C. Section 01 91 13 - General Commissioning Requirements: Additional requirements applicable to demonstration and training.

D. Other Specification Sections: Additional requirements for demonstration and training.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
   1. Make all submittals specified in this section, and elsewhere where indicated for commissioning purposes, directly to the Commissioning Authority.
   2. Submit one copy to the Commissioning Authority, not to be returned.
   3. Make commissioning submittals on time schedule specified by Commissioning Authority.
   4. Submittals indicated as "Draft" are intended for the use of the Commissioning Authority in preparation of overall Training Plan; submit in editable electronic format, Microsoft Word 2003 preferred.

B. Training Plan: City will designate personnel to be trained; tailor training to needs and skill-level of attendees.
   1. Submit to Architect for transmittal to City.
   2. Submit to Commissioning Authority for review and inclusion in overall training plan.
   3. Submit not less than four weeks prior to start of training.
   4. Revise and resubmit until acceptable.
   5. Provide an overall schedule showing all training sessions.
   6. Include at least the following for each training session:
      a. Identification, date, time, and duration.
      b. Description of products and/or systems to be covered.
      c. Name of firm and person conducting training; include qualifications.
      d. Intended audience, such as job description.
      e. Objectives of training and suggested methods of ensuring adequate training.

f. Methods to be used, such as classroom lecture, live demonstrations, hands-on, etc.
g. Media to be used, such a slides, hand-outs, etc.
h. Training equipment required, such as projector, projection screen, etc., to be provided by Contractor.

7. Provide Subject Matter Experts (SME) for each software system. Include software system maintenance, support, license, updates, cybersecurity protection. Include software systems specifications and any hardware required. Provide software dependencies, system management/access, software integration. Provide training availability for a 6 month period post date of substantial completion.

C. Training Manuals: Provide training manual for each attendee; allow for minimum of two attendees per training session.
1. Include applicable portion of O&M manuals.
2. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.
3. Provide one extra copy of each training manual to be included with operation and maintenance data.
4. Ensure materials are up to date with the current/latest information for software systems installed.
5. Provide PDF copies of documenation as well as hard copies.

D. Training Reports:
1. Identification of each training session, date, time, and duration.
2. Sign-in sheet showing names and job titles of attendees.
3. List of attendee questions and written answers given, including copies of and references to supporting documentation required for clarification; include answers to questions that could not be answered in original training session.
4. Include Commissioning Authority's formal acceptance of training session.

E. Video Recordings: Submit digital video recording of each demonstration and training session for City's subsequent use.
1. Format: DVD Disc.
2. Label each disc and container with session identification and date.
3. Provide a copy saved in a common digital video format: mp4.

1.04 QUALITY ASSURANCE

A. Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.
1. Provide as instructors the most qualified trainer of those contractors and/or installers who actually supplied and installed the systems and equipment.
2. Where a single person is not familiar with all aspects, provide specialists with necessary qualifications.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 DEMONSTRATION - GENERAL

A. Demonstrations conducted during system start-up do not qualify as demonstrations for the purposes of this section, unless approved in advance by City.

B. Demonstrations conducted during Functional Testing need not be repeated unless City personnel training is specified.

C. Demonstration may be combined with City personnel training if applicable.

D. Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventive maintenance.
1. Perform demonstrations not less than two weeks prior to Substantial Completion.

2. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

E. Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.
   1. Perform demonstrations not less than two weeks prior to Substantial Completion.

F. Demonstrate and test vendor remote access support and/or reconfiguration via secure VPN authorized by City of Stockton IT Department.

3.02 TRAINING - GENERAL

A. Conduct training on-site unless otherwise indicated.

B. City will provide classroom and seating at no cost to Contractor. Location is to be determined.

C. Do not start training until Functional Testing is complete, unless otherwise specified or approved by the Commissioning Authority.

D. Provide training in minimum two hour segments.

E. The Commissioning Authority is responsible for determining that the training was satisfactorily completed and will provide approval forms.

F. Training schedule will be subject to availability of City's personnel to be trained; re-schedule training sessions as required by City; once schedule has been approved by City failure to conduct sessions according to schedule will be cause for City to charge Contractor for personnel "show-up" time.

G. Review of Facility Policy on Operation and Maintenance Data: During training discuss:
   1. The location of the O&M manuals and procedures for use and preservation; backup copies.
   2. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.
   3. Typical uses of the O&M manuals.

H. Product- and System-Specific Training:
   1. Review the applicable O&M manuals.
   2. For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.
   3. Review instructions for proper operation in all modes, including start-up, shut-down, seasonal changeover and emergency procedures, and for maintenance, including preventative maintenance.
   4. Provide hands-on training on all operational modes possible and preventive maintenance.
   5. Emphasize safe and proper operating requirements; discuss relevant health and safety issues and emergency procedures.
   6. Discuss common troubleshooting problems and solutions.
   7. Discuss any peculiarities of equipment installation or operation.
   8. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
   9. Review recommended tools and spare parts inventory suggestions of manufacturers.
   10. Review spare parts and tools required to be furnished by Contractor.
   11. Review spare parts suppliers and sources and procurement procedures.

I. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within three days.

END OF SECTION 01 79 00

This page intentionally left blank

SECTION 01 91 13
GENERAL COMMISSIONING REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY

A. Commissioning is intended to achieve the following specific objectives; this section specifies the Contractor's responsibilities for commissioning:
   1. Verify that the work is installed in accordance with Contract Documents and the manufacturer's recommendations and instructions, and that it receives adequate operational checkout prior to startup: Startup reports and Prefunctional Checklists executed by Contractor are utilized to achieve this.
   2. Verify and document that functional performance is in accordance with Contract Documents: Functional Tests executed by Contractor and witnessed by the Commissioning Authority are utilized to achieve this.
   3. Verify that operation and maintenance manuals submitted to City are complete: Detailed operation and maintenance (O&M) data submittals by Contractor are utilized to achieve this.
   4. Verify that the City's operating personnel are adequately trained: Formal training conducted by Contractor is utilized to achieve this.

B. Commissioning, including Functional Tests, O&M documentation review, and training, is to occur after startup and initial checkout and be completed before Substantial Completion.

C. The Commissioning Authority directs and coordinates all commissioning activities; this section describes some but not all of the Commissioning Authority's responsibilities.

D. The Commissioning Authority is employed by City.

1.02 SCOPE OF COMMISSIONING

A. The following are to be commissioned:

B. Fire Protection Systems.

C. Plumbing Systems:
   1. Water heaters.
   2. Booster pumps.

D. Landscape irrigation.

E. HVAC System, including:
   1. Major and minor equipment items.
   2. Piping systems and equipment.
   3. Ductwork and accessories.
   4. Control system.
   5. Variable frequency drives.

F. Electrical Systems:
   1. Power quality.
   2. Lighting controls other than manual switches.

G. Electronic Safety and Security:
   1. Security system, including doors and hardware.
   2. Fire and smoke alarms.

H. Communications:
   1. Voice and data systems.
   2. Public address/paging.

I. Other equipment and systems explicitly identified elsewhere in Contract Documents as requiring commissioning.

J. Indoor Air Quality Procedures: The Commissioning Authority will coordinate; Contractor will execute; see Section 01 57 19 - Temporary Environmental Controls.

1.03 RELATED REQUIREMENTS

A. Standard Specifications and Section - 00 72 13 Special Provisions: Additional requirements related to Contractor's responsibilities, administrative requirements, and procedures.

B. Section 01 57 19 - Temporary Environmental Controls: Precautions and procedures; smoking room testing; building flush-out.

C. Section 01 70 00 - Execution and Closeout Requirements: General startup requirement, also scope and procedures for operation and maintenance manuals and project record documents.

D. Section 01 78 00 - Closeout Submittals: Scope and procedures for operation and maintenance manuals and project record documents.

E. Section 01 79 00 - Demonstration and Training: Scope and procedures for City personnel training.

F. Section 21 08 00 - Commissioning of Fire Suppression: Fire Suppression related commissioning requirements.

G. Section 22 08 00 - Commissioning of Plumbing Systems: Plumbing related commissioning requirements.

H. Section 23 08 00 - Commissioning of Mechanical Systems: Mechanical related commissioning requirements.

I. Section 26 08 00 - Electrical Commissioning Requirements: Electrical related commissioning requirements.

J. Section 27 08 00 - Commissioning of Communications: Communications related commissioning requirements.

K. Section 28 08 00 - Commissioning of Electronic Safety and Security: Electronic Safety and Security related commissioning requirements.

1.04 REFERENCE STANDARDS

A. CSI/CSC MF - Masterformat 2016.

B. PECI (Samples) - Sample Forms for Prefunctional Checklists and Functional Performance Tests Current Edition.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures; except:
   1. Make all submittals specified in this section, and elsewhere where indicated for commissioning purposes, directly to the Commissioning Authority, unless they require review by Architect; in that case, submit to Architect first.
   2. Submit one copy to the Commissioning Authority, not to be returned.
   3. Make commissioning submittals on time schedule specified by Commissioning Authority.
   4. Submittals indicated as "Draft" are intended for the use of the Commissioning Authority in preparation of Prefunctional Checklists or Functional Test requirements; submit in editable electronic format, Microsoft Word 2010 preferred.
   5. As soon as possible after submittals made to Architect are approved, submit copy of approved submittal to the Commissioning Authority.

B. Product Data: If submittals to Architect do not include the following, submit copies as soon as possible:
   1. Manufacturer's product data, cut sheets, and shop drawings.
   2. Manufacturer's installation instructions.
   3. Startup, operating, and troubleshooting procedures.
   4. Fan and pump curves.
   5. Factory test reports.

6. Warranty information, including details of City's responsibilities in regard to keeping warranties in force.

C. Manufacturers' Instructions: Submit copies of all manufacturer-provided instructions that are shipped with the equipment as soon as the equipment is delivered.

D. Startup Plans and Reports.

E. Completed Prefunctional Checklists.

1.06 QUALITY ASSURANCE

A. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

PART 2 PRODUCTS

2.01 TEST EQUIPMENT

A. Provide all standard testing equipment required to perform startup and initial checkout and required Functional Testing; unless otherwise noted such testing equipment will NOT become the property of City.

B. Calibration Tolerances: Provide testing equipment of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified. If not otherwise noted, the following minimum requirements apply:
   1. Temperature Sensors and Digital Thermometers: Certified calibration within past year to accuracy of 0.5 degree F and resolution of plus/minus 0.1 degree F.
   2. Pressure Sensors: Accuracy of plus/minus 2.0 percent of the value range being measured (not full range of meter), calibrated within the last year.
   3. Calibration: According to the manufacturer’s recommended intervals and when dropped or damaged; affix calibration tags or keep certificates readily available for inspection.

C. Equipment-Specific Tools: Where special testing equipment, tools and instruments are specific to a piece of equipment, are only available from the vendor, and are required in order to accomplish startup or Functional Testing, provide such equipment, tools, and instruments as part of the work at no extra cost to City; such equipment, tools, and instruments are to become the property of City.

D. Dataloggers: Independent equipment and software for monitoring flows, currents, status, pressures, etc. of equipment.
   1. Dataloggers required to for Functional Tests will be provided by the Commissioning Authority and will not become the property of City.

PART 3 EXECUTION

3.01 COMMISSIONING PLAN

A. Commissioning Authority will prepare the Commissioning Plan.
   1. Attend meetings called by the Commissioning Authority for purposes of completing the commissioning plan.
   2. Require attendance and participation of relevant subcontractors, installers, suppliers, and manufacturer representatives.

B. Contractor is responsible for compliance with the Commissioning Plan.

C. Commissioning Plan: The commissioning schedule, procedures, and coordination requirements for all parties in the commissioning process.

D. Commissioning Schedule:
   1. Submit anticipated dates of startup of each item of equipment and system to Commissioning Authority within 60 days after award of Contract.
   2. Re-submit anticipated startup dates monthly, but not less than 4 weeks prior to startup.
   3. Prefunctional Checklists and Functional Tests are to be performed in sequence from components, to subsystems, to systems.

4. Provide sufficient notice to Commissioning Authority for delivery of relevant Checklists and Functional Test procedures, to avoid delay.

3.02 DOCUMENTATION IDENTIFICATION SYSTEM

A. Give each submitted form or report a unique identification; use the following scheme.

B. Type of Document: Use the following prefixes:
   1. Startup Plan: SP-.
   2. Startup Report: SR-.
   3. Prefunctional Checklist: PC-.
   4. Functional Test Procedure: FTP-.
   5. Functional Test Report: FTR-.

C. System Type: Use the first 4 digits from CSI/CSC MF (Master Format), that are applicable to the system; for example:
   1. 2300: HVAC system as a whole.
   2. 2320: HVAC Piping and Pumps.
   3. 2330: HVAC Air Distribution.

D. Component Number: Assign numbers sequentially, using 1, 2, or 3 digits as required to accommodate the number of units in the system.

E. Test, Revision, or Submittal Number: Number each successive iteration sequentially, starting with 1.

F. Example: PC-2320-001.2 would be the Prefunctional Checklist for equipment item 1 in the HVAC piping system, probably a pump; this is the second, revised submittal of this checklist.

3.03 STARTUP PLANS AND REPORTS

A. Startup Plans: For each item of equipment and system for which the manufacturer provides a startup plan, submit the plan not less than 8 weeks prior to startup.

B. Startup Reports: For each item of equipment and system for which the manufacturer provides a startup checklist (or startup plan or field checkout sheet), document compliance by submitting the completed startup checklist prior to startup, signed and dated by responsible entity.

C. Submit directly to the Commissioning Authority.

3.04 PREFUNCTIONAL CHECKLISTS

A. A Prefunctional Checklist is required to be filled out for each item of equipment or other assembly specified to be commissioned.
   1. No sampling of identical or near-identical items is allowed.
   2. These checklists do not replace manufacturers' recommended startup checklists, regardless of apparent redundancy.
   3. Prefunctional Checklist forms will not be complete until after award of the contract; the following types of information will be gathered via the completed Checklist forms:
      a. Certification by installing contractor that the unit is properly installed, started up, and operating and ready for Functional Testing.
      b. Confirmation of receipt of each shop drawing and commissioning submittal specified, itemized by unit.
      c. Manufacturer, model number, and relevant capacity information; list information "as specified," "as submitted," and "as installed."
      d. Serial number of installed unit.
      e. List of inspections to be conducted to document proper installation prior to startup and Functional Testing; these will be primarily static inspections and procedures; for equipment and systems may include normal manufacturer’s start-up checklist items and minor testing.
      f. Sensor and actuator calibration information.
   4. PECI (Samples) found at http://www.peci.org/library/mcpgs.htm indicate anticipated level of detail for Prefunctional Checklists.

B. Contractor is responsible for filling out Prefunctional Checklists, after completion of installation and before startup; witnessing by the Commissioning Authority is not required unless otherwise specified.
   1. Each line item without deficiency is to be witnessed, initialed, and dated by the actual witness; checklists are not complete until all line items are initialed and dated complete without deficiencies.
   2. Checklists with incomplete items may be submitted for approval provided the Contractor attests that incomplete items do not preclude the performance of safe and reliable Functional Testing; re-submission of the Checklist is required upon completion of remaining items.
   3. Individual Checklists may contain line items that are the responsibility of more than one installer; Contractor shall assign responsibility to appropriate installers or subcontractors, with identification recorded on the form.
   4. If any Checklist line item is not relevant, record reasons on the form.
   5. Contractor may independently perform startup inspections and/or tests, at Contractor's option.
   6. Regardless of these reporting requirements, Contractor is responsible for correct startup and operation.
   7. Submit completed Checklists to Commissioning Authority within two days of completion.
   8. See Section 01 70 00 - Execution and Closeout Requirements for additional general startup requirements.

C. Commissioning Authority is responsible for furnishing the Prefunctional Checklists to Contractor.
   1. Initial Drafts: Contractor is responsible for initial draft of Prefunctional Checklist where so indicated in Contract Documents.
   2. Provide all additional information requested by Commissioning Authority to aid in preparation of checklists, such as shop drawing submittals, manufacturers' startup checklists, and O&M data.
   3. Commissioning Authority may add any relevant items deemed necessary regardless of whether they are explicitly mentioned in Contract Documents or not.
   4. When asked to review the proposed Checklists, do so in a timely manner.

D. Commissioning Authority Witnessing: Required for:
   1. Each piece of primary equipment, unless sampling of multiple similar units is allowed by the commissioning plan.
   2. A sampling of non-primary equipment, as allowed by the commissioning plan.

E. Deficiencies: Correct deficiencies and re-inspect or re-test, as applicable, at no extra cost to City.
   1. If difficulty in correction would delay progress, report deficiency to the Commissioning Authority immediately.

3.05 FUNCTIONAL TESTS

A. A Functional Test is required for each item of equipment, system, or other assembly specified to be commissioned, unless sampling of multiple identical or near-identical units is allowed by the final test procedures.

B. Contractor is responsible for execution of required Functional Tests, after completion of Prefunctional Checklist and before closeout.

C. Commissioning Authority is responsible for witnessing and reporting results of Functional Tests, including preparation and completion of forms for that purpose.

D. Contractor is responsible for correction of deficiencies and re-testing at no extra cost to City; if a deficiency is not corrected and re-tested immediately, the Commissioning Authority will document the deficiency and the Contractor's stated intentions regarding correction.
   1. Deficiencies are any condition in the installation or function of a component, piece of equipment or system that is not in compliance with Contract Documents or does not

perform properly.

2. When the deficiency has been corrected, the Contractor completes the form certifying that the item is ready to be re-tested and returns the form to the Commissioning Authority; the Commissioning Authority will reschedule the test and the Contractor shall re-test.
3. Identical or Near-Identical Items: If 10 percent, or three, whichever is greater, of identical or near-identical items fail to perform due to material or manufacturing defect, all items will be considered defective; provide a proposal for correction within 2 weeks after notification of defect, including provision for testing sample installations prior to replacement of all items.
4. Contractor shall bear the cost of City and Commissioning Authority personnel time witnessing re-testing.
5. Contractor shall bear the cost of City and Commissioning Authority personnel time witnessing re-testing if the test failed due to failure to execute the relevant Prefunctional Checklist correctly; if the test failed for reasons that would not have been identified in the Prefunctional Checklist process, Contractor shall bear the cost of the second and subsequent re-tests.

E. Functional Test Procedures:
1. Some test procedures are included in Contract Documents; where Functional Test procedures are not included in Contract Documents, test procedures will be determined by the Commissioning Authority with input by and coordination with Contractor.
2. Examples of Functional Testing:
   a. Test the dynamic function and operation of equipment and systems (rather than just components) using manual (direct observation) or monitoring methods under full operation (e.g., the chiller pump is tested interactively with the chiller functions to see if the pump ramps up and down to maintain the differential pressure setpoint).
   b. Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc.
   c. Systems are run through all the HVAC control system’s sequences of operation and components are verified to be responding as the sequence's state.
   d. Traditional air or water test and balancing (TAB) is not Functional Testing; spot checking of TAB by demonstration to the Commissioning Authority is Functional Testing.
3. PECI (Samples) found at http://www.peci.org/library/mcpgs.htm indicated anticipated level of detail for Functional Tests.

F. Deferred Functional Tests: Some tests may need to be performed later, after substantial completion, due to partial occupancy, equipment, seasonal requirements, design or other site conditions; performance of these tests remains the Contractor's responsibility regardless of timing.

3.06 SENSOR AND ACTUATOR CALIBRATION

A. Calibrate all field-installed temperature, relative humidity, carbon monoxide, carbon dioxide, and pressure sensors and gauges, and all actuators (dampers and valves) on this piece of equipment shall be calibrated. Sensors installed in the unit at the factory with calibration certification provided need not be field calibrated.

B. Calibrate using the methods described below; alternate methods may be used, if approved by Commissioning Authority and Owner beforehand. See PART 2 for test instrument requirements. Record methods used on the relevant Prefunctional Checklist or other suitable forms, documenting initial, intermediate and final results.

C. All Sensors:
1. Verify that sensor location is appropriate and away from potential causes of erratic operation.
2. Verify that sensors with shielded cable are grounded only at one end.

3. For sensor pairs that are used to determine a temperature or pressure difference, for temperature make sure they are reading within 0.2 degree F of each other, and for pressure, within tolerance equal to 2 percent of the reading, of each other.
4. Tolerances for critical applications may be tighter.

D. Sensors Without Transmitters - Standard Application:
1. Make a reading with a calibrated test instrument within 6 inches of the site sensor.
2. Verify that the sensor reading, via the permanent thermostat, gauge or building automation system, is within the tolerances in the table below of the instrument-measured value.
3. If not, install offset, calibrate or replace sensor.

E. Sensors With Transmitters - Standard Application.
1. Disconnect sensor.
2. Connect a signal generator in place of sensor.
3. Connect ammeter in series between transmitter and building automation system control panel.
4. Using manufacturer's resistance-temperature data, simulate minimum desired temperature.
5. Adjust transmitter potentiometer zero until 4 mA is read by the ammeter.
6. Repeat for the maximum temperature matching 20 mA to the potentiometer span or maximum and verify at the building automation system.
7. Record all values and recalibrate controller as necessary to comply with specified control ramps, reset schedules, proportional relationship, reset relationship and P/I reaction.
8. Reconnect sensor.
9. Make a reading with a calibrated test instrument within 6 inches of the site sensor.
10. Verify that the sensor reading, via the permanent thermostat, gauge or building automation system, is within the tolerances in the table below of the instrument-measured value.
11. If not, replace sensor and repeat.
12. For pressure sensors, perform a similar process with a suitable signal generator.

F. Sensor Tolerances for Standard Applications: Plus/minus the following maximums:
1. Watthour, Voltage, Amperage: 1 percent of design.
2. Pressure, Air, Water, Gas: 3 percent of design.
3. Air Temperatures (Outside Air, Space Air, Duct Air): 0.4 degrees F.
4. Relative Humidity: 4 percent of design.
5. Barometric Pressure: 0.1 inch of Hg.
6. Flow Rate, Air: 10 percent of design.
7. Flow Rate, Water: 4 percent of design.
8. AHU Wet Bulb and Dew Point: 2.0 degrees F.

G. Critical Applications: For some applications more rigorous calibration techniques may be required for selected sensors. Describe any such methods used on an attached sheet.

H. Valve/Damper Stroke Setup and Check:
1. For all valve/damper actuator positions checked, verify the actual position against the control system readout.
2. Set pump/fan to normal operating mode.
3. Command valve/damper closed; visually verify that valve/damper is closed and adjust output zero signal as required.
4. Command valve/damper to open; verify position is full open and adjust output signal as required.
5. Command valve/damper to a few intermediate positions.
6. If actual valve/damper position does not reasonably correspond, replace actuator or add pilot positioner (for pneumatics).

I. Isolation Valve or System Valve Leak Check: For valves not associated with coils.

1. With full pressure in the system, command valve closed.
2. Use an ultra-sonic flow meter to detect flow or leakage.

3.07 TEST PROCEDURES - GENERAL

A. Provide skilled technicians to execute starting of equipment and to execute the Functional Tests. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem-solving.

B. Provide all necessary materials and system modifications required to produce the flows, pressures, temperatures, and conditions necessary to execute the test according to the specified conditions. At completion of the test, return all affected equipment and systems to their pre-test condition.

C. Sampling: Where Functional Testing of fewer than the total number of multiple identical or near-identical items is explicitly permitted, perform sampling as follows:
   1. Identical Units: Defined as units with same application and sequence of operation; only minor size or capacity difference.
   2. Sampling is not allowed for:
      a. Major equipment.
      b. Life-safety-critical equipment.
      c. Prefunctional Checklist execution.
   3. XX = the percent of the group of identical equipment to be included in each sample; defined for specific type of equipment.
   4. YY = the percent of the sample that if failed will require another sample to be tested; defined for specific type of equipment.
   5. Randomly test at least XX percent of each group of identical equipment, but not less than three units. This constitutes the "first sample."
   6. If YY percent of the units in the first sample fail, test another XX percent of the remaining identical units.
   7. If YY percent of the units in the second sample fail, test all remaining identical units.
   8. If frequent failures occur, resulting in more troubleshooting than testing, the Commissioning Authority may stop the testing and require Contractor to perform and document a checkout of the remaining units prior to continuing testing.

D. Manual Testing: Use hand-held instruments, immediate control system readouts, or direct observation to verify performance (contrasted to analyzing monitored data taken over time to make the “observation”).

E. Simulating Conditions: Artificially create the necessary condition for the purpose of testing the response of a system; for example apply hot air to a space sensor using a hair dryer to see the response in a VAV box.

F. Simulating Signals: Disconnect the sensor and use a signal generator to send an amperage, resistance or pressure to the transducer and control system to simulate the sensor value.

G. Over-Writing Values: Change the sensor value known to the control system in the control system to see the response of the system; for example, change the outside air temperature value from 50 degrees F to 75 degrees F to verify economizer operation.

H. Indirect Indicators: Remote indicators of a response or condition, such as a reading from a control system screen reporting a damper to be 100 percent closed, are considered indirect indicators.

I. Monitoring: Record parameters (flow, current, status, pressure, etc.) of equipment operation using dataloggers or the trending capabilities of the relevant control systems; where monitoring of specific points is called for in Functional Test Procedures:
   1. All points that are monitored by the relevant control system shall be trended by Contractor; at the Commissioning Authority’s request, Contractor shall trend up to 20 percent more points than specified at no extra charge.
   2. Other points will be monitored by the Commissioning Authority using dataloggers.

3. At the option of the Commissioning Authority, some control system monitoring may be replaced with datalogger monitoring.
4. Provide hard copies of monitored data in columnar format with time down left column and at least 5 columns of point values on same page.
5. Graphical output is desirable and is required for all output if the system can produce it.
6. Monitoring may be used to augment manual testing.

3.08 OPERATION AND MAINTENANCE MANUALS

A. See Section 01 78 00 - Closeout Submittals for additional requirements.

B. Add design intent documentation furnished by Architect to manuals prior to submission to City.

C. Submit manuals related to items that were commissioned to Commissioning Authority for review; make changes recommended by Commissioning Authority.

D. Commissioning Authority will add commissioning records to manuals after submission to City.

END OF SECTION 01 91 13

This page intentionally left blank

SECTION 02 08 00
ASBESTOS REMOVAL & MITIGATION

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. The asbestos abatement and disturbance Work related to this Project will consist of the removal and disposal of asbestos containing materials (ACM), asbestos containing construction materials (ACCM), and presumed asbestos containing materials (PACM) at the Waterfront Towers Property located at 501 and 509 West Weber Avenue, Stockton, California (Site), as a part of a planned modernization renovation project. The abatement specification applies to both buildings at the Site.

B. Included in this reference abatement specification document is the details such as the identification, location and approximate quantities of the ACM identified in the two buildings that must be abated prior to planned renovation activities. This section is intended to provide instruction for requirements in connection with asbestos abatement or disturbance to materials containing asbestos and is complementary to the other contract documents, which apply to this section by reference.

C. For Work described in this Section, the Contractor shall furnish all labor, materials, equipment, tools and any other resources necessary to complete the Work in accordance with regulatory requirements and project contract documents, using best available technology and industry standard methods and procedures. The work shall include but not be limited to the removal and/or disturbance of identified ACM, and PACM as described in the tables below.

D. Estimated quantities are provided as an approximate guide to the Contractor. The Owner's representative is not responsible for the accuracy of the quantities and measurements provided. The Contractor shall field verify all material quantities, locations and make themselves cognizant of existing field conditions prior to submitting bids for the work of this specification. Submitting of bids for work described herein shall take into consideration and utilize the Contractor's field measurements of materials and observations of the conditions verified on site.

E. The Contractor shall be aware of all conditions of the Project and is responsible for verifying quantities and locations of Work to be performed. Failure to do so shall not relieve the Contractor of its obligation to furnish labor, equipment and materials necessary to perform and complete the Work.

F. Work shall be performed in strict accordance with the Project Documents and all governing codes, rules and regulations. Where conflicts occur between the Project Documents and applicable codes, rules, and regulations, the more stringent requirement shall apply.

G. Working hours shall be as required and approved by the Owner. Asbestos abatement activities including, but not limited to, Work Area preparation, gross removal activities, cleaning activities, waste removal, etc. may need to be performed during 'off-hours' (including nights and weekends). In addition, multiple mobilizations may be required to perform the work identified in this project. The Contractor shall coordinate and schedule all Work with the facility and Owner's representative.

ASBESTOS CONTAINING MATERIALS (ACM) INCLUDED IN THE BASE PRICE

H. Building 1: 501 West Weber Avenue, Stockton, California:

Asbestos Containing Material	Location(s)	Est. Quantity (Sq. Ft.)	NESHAP CATEGORY
Penetration Mastic (Black/Gray/ Silver)	Roof Penetrations and Sealants	230 SF	Category 2 Non-Friable

I. Building 2 - 509 West Weber Avenue, Stockton, California:

Asbestos Containing Material	Location(s)	Est. Quantity (Sq. Ft.)	NESHAP CATEGORY
Penetration Mastic (Black/Gray/ Silver)	Roof Penetrations and Sealants at skylight and HVAC Ducting	250 SF	Category 2 Non-Friable
Mastic (black) under 12" Floor tile White and Gray.	Suite 101 Electric Closet and Suite 104 storage closet	120 SF	Category 1 Non-Friable

1.02 SPECIAL JOB CONDITIONS

A. Any special job conditions, including variances obtained by the Owner, shall be addressed in other sections of the contract specifications.

1.03 PERMITS AND COMPLIANCE

A. The Contractor shall assume full responsibility and liability for compliance with all applicable Federal, State, and local laws, rules, and regulations pertaining to Work practices, protection of Workers, authorized visitors to the site, persons, and property adjacent to the Work.

B. Perform asbestos related Work in accordance with California Code of Regulations, San Joaquin Valley Air Pollution Control District (SJVAPCD) Rule 906 requirements, and the United States Federal Register 40 CFR 61, and 29 CFR 1926. Where more stringent requirements are specified, the Contractor shall adhere to the more stringent requirements.

C. The Contractor is responsible for providing copies of Asbestos Survey Reports, as required by governing agencies in obtaining required permits to perform work as well as any other applicable documents as may be required by governing agencies.

D. The Contractor must maintain current licenses pursuant to the California State Licensing Board and the Division of Occupational Safety and Health for all Work related to this Project, including the removal, handling, transport, and disposal of asbestos containing materials.

E. The Contractor must have and submit proof upon request that any persons employed by the Contractor to engage in or supervise Work on the Project have met the requirements of employment verification as required by the Department of Homeland Security, U.S. Citizenship and Immigration Services, possess the required asbestos worker and/or supervisor training with proof of current validation.

F. The Contractor shall comply fully with any variance secured from regulatory agencies by the Owner in the performance of the Work. Any variance applications previously submitted, if applicable, are included in other specification sections.

G. The Contractor shall be responsible for obtaining any variances, if such variance, is determined to be the most feasible and safe approach to work. Approval of the Owner is required prior to submission of a variance application to any regulatory agency.

H. Failure to adhere to the Project Documents shall constitute a breach of the Contract and the Owner shall have the right to and may terminate the Contract provided, however, the failure of the Owner to so terminate shall not relieve the Contractor from future compliance.

1.04 SUBMITTALS

A. Pre-Work Submittals: Within 7 days prior to the pre-construction conference, the Contractor shall submit 3 copies of the documents listed below to the project Architect or Owner’s representative, with 1 copy transmitted to the Environmental Consultant for review and approval prior to the commencement of asbestos abatement activities:
   1. Contractor licenses issued by the California State Licensing Board and Division of Occupational Safety and Health.
   2. Progress Schedule:

a. Show the complete sequence of abatement activities and the sequencing of Work within each building or building section.
b. Show the dates for the beginning and completion of each major element of Work including substantial completion dates for each Work Area, building, or phase.

3. Project Notifications: As required by Federal, State and SJVAQMD regulatory agencies together with proof of transmittal (i.e. certified mail return receipt).
4. Site Control and Notification Plan
5. Abatement Work Plan: Provide plans that clearly indicate the following:
   a. All Work Areas/containments numbered sequentially.
   b. Locations and types of all decontamination enclosures.
   c. Entrances and exits to the Work Areas/containments.
   d. Type of abatement activity/technique for each Work Area/containment.
   e. Number and location of negative air units and exhaust. Also provide calculations for determining number of negative air pressure units.
   f. Proposed location and construction of storage facilities and field office.
   g. Location of water and electrical connections to building services.
   h. Waste transport routes through the building(s) to the waste storage container.
6. Letter of acknowledgment from Disposal Site/Landfill where asbestos waste will be disposed.
7. Current worker training, medical clearance, and respiratory fit-test records.
8. Copies of other required permits (e.g. HEPA-filtered equipment, city/county permits.

B. On-Site Submittals: Refer to Part 3.01.C for all submittals, documentation, and postings required to be maintained on-site during abatement activities.

C. Project Close-out Submittals: Within 30 days of the completion of each abatement phase, the Contractor shall submit 4 copies of the documents listed below. One set of the documents shall be transmitted to the Environmental Consultant for review and approval prior to the Contractor's final payment.
1. Originals of all waste disposal manifests, and disposal logs.
2. OSHA compliance air monitoring records conducted during the Work.
3. Daily progress log describing in detail the areas of work and ACM/ACCM/PACM affected by the day's work activities and regulated Work Area entry/exit logs.
4. A list of all Workers used in the performance of the Project, including name, social security number, asbestos training certification numbers and type of certification (i.e. supervisor, asbestos worker, etc.).
5. For each Worker used in the performance of the Project, submit the Worker's Acknowledgment Statement.
6. Disposal Site/Landfill Permit from applicable regulatory agency.
7. Project notifications, amended notifications, and Work Place Safety Plan - Signed Statement of Asbestos Project Completion form.

1.05 PRE-CONSTRUCTION CONFERENCE

A. Prior to start of preparatory Work under this Contract, the Contractor shall attend a pre-construction conference attended by Owner, Facility Personnel, and Environmental Consultant.

B. Agenda for this conference shall include but not necessarily be limited to:
1. Contractor's scope of Work, Work plan, and schedule to include number of workers and shifts for each phase of work.
2. Contractor's safety and health precautions including protective clothing and equipment and decontamination procedures.
3. Environmental Consultant's duties, functions, and authority.
4. Contractor's Work procedures including:
   a. Methods of job site preparation and removal methods.
   b. Respiratory protection.
   c. Disposal procedures.

d. Cleanup procedures.
e. Fire exits and emergency procedures.

5. Contractor’s required pre-work and on-site submittals, documentation, and postings.
6. Contractor's plan for twenty-four (24) hour Project security both for prevention of theft and for barring entry of unauthorized personnel into Work Areas.
7. Temporary utilities.
8. Handling of furniture and other moveable objects.
9. Storage of removed asbestos containing materials.
10. Waste disposal requirements and procedures.

C. In conjunction with the conference the Contractor shall accompany the Owner and Environmental Consultant on a pre-construction walk-through documenting existing condition of finishes and furnishings, reviewing overall Work plan, location of fire exits, fire protection equipment, water supply and temporary utilities (water/sewer/electric) tie-in.

1.06 APPLICABLE STANDARDS AND REGULATIONS

A. The Contractor shall comply with the following codes and standards, except where more stringent requirements are shown or specified:

B. Federal Regulations:
1. 29 CFR 1910.1001, "Asbestos" (OSHA)
2. 29 CFR 1910.1200, "Hazard Communication" (OSHA)
3. 29 CFR 1910.134, "Respiratory Protection" (OSHA)
4. 29 CFR 1910.145, "Specification for Accident Prevention Signs and Tags" (OSHA)
5. 29 CFR 1926, "Construction Industry" (OSHA)
6. 29 CFR 1926.1101, "Asbestos, Tremolite, Anthophyllite, and Actinolite" (OSHA)
7. 29 CFR 1926.500 "Guardrails, Handrails and Covers" (OSHA)
8. 40 CFR 61, Subpart A, "General Provisions" (EPA)
9. 40 CFR 61, Subpart M, "National Emission Standard for Asbestos" (EPA)
10. 49 CFR 171-172, Transportation Standards (DOT)

C. California State Regulations:
1. CCR Title 8, Section 1529
2. CCR Title 8, Section 5208
3. CCR Title 8, Section 5144

D. Local Regulations:
1. Applicable San Joaquin Valley Air Pollution Control District regulations

E. Standards and Guidance Documents:
1. American National Standard Institute (ANSI) Z88.2-80, Practices for Respiratory Protection
2. ANSI Z9.2-79, Fundamentals Governing the Design and Operation of Local Exhaust Systems
3. EPA 560/585-024, Guidance for Controlling Asbestos Containing Materials in Buildings (Purple Book)
4. EPA 530-SW-85-007, Asbestos Waste Management Guidance
5. ASTM Standard E1368 “Standard Practice for Visual Inspection of Asbestos Abatement Projects.”

1.07 NOTICES

A. The Contractor shall provide notification of intent to commence asbestos abatement activities as indicated below.
1. At least ten (10) days prior to beginning abatement activities send written notification to: San Joaquin Valley Air Pollution Control District (SJVAPCD).
2. At least twenty-four (24) hours prior to beginning abatement activities provide a temporary job/work site notification to the nearest Cal-OSHA, Division of Occupational Safety and Health office.

B. The Contractor shall maintain copies of notices, document, and provide proof of delivery and receipt.

C. The Contractor shall be responsible for maintaining current project filings with regulatory agencies for the duration of the project.

D. The Contractor shall post and/or provide Building Occupant Notification of work in accordance with Proposition 65 requirements.

E. The Contractor shall post the Asbestos Abatement Notice prior to beginning abatement activities as required by SJVAQMD and EPA NESHAP regulations. Also post a floor plans in the area of work depicting the locations of work and restricted access.

1.08 PROJECT MONITORING AND AIR SAMPLING

A. The Owner shall engage the services of an Environmental Consultant (the Consultant) who shall serve as the Owner's Representative in regard to the performance of the asbestos abatement Project and provide direction as required throughout the entire abatement Project period.

B. The Contractor is required to ensure cooperation of its personnel with the Consultant for the air sampling and Project monitoring functions described in this section. The Contractor shall comply with all direction given by the Consultant during the course of the Project.

C. The Consultant shall provide the following administrative services:
   1. Review and approve or disapprove all submittals, shop drawings, schedules, and samples.
   2. Assure that all notifications to governmental agencies by the Contractor are submitted in a timely manner and are correct in content.

D. The Consultant shall staff the Project with a trained and certified person(s) to act on the Owner's behalf at the job site. This individual shall be designated as the Abatement Project Monitor (APM).
   1. The APM shall be on-site at all times the Contractor is on-site. The Contractor shall not be permitted to conduct any Work unless the APM is on-site (except for inspection of barriers and negative air system during non-working days).
   2. The APM shall have the authority to direct the actions of the Contractor verbally and in writing to ensure compliance with the Project documents and all regulations. The APM shall have the authority to Stop Work when gross Work practice deficiencies or unsafe practices are observed, or when ambient fiber concentrations outside the removal area exceed 0.01 f/cc or background level.
      a. Such Stop Work order shall be effective immediately and remain in effect until corrective measures have been taken and the situation has been corrected.
      b. Standby time required to resolve the situation shall be at the Contractor's expense.
   3. The APM shall provide the following services:
      a. Inspection of the Contractor's Work, practices, and procedures, including temporary protection requirements, for compliance with all regulations and Project specifications including provisions required by Variances, the Work Place Safety Plan and Asbestos Work Permit.
      b. Provide abatement Project air sampling as required by applicable regulations and the Owner. Sampling will include background, Work Area preparation, asbestos handling, and final cleaning and clearance air sampling.
      c. Verify daily that all Workers used in the performance of the Project are certified by the appropriate regulatory agency.
      d. Monitor the progress of the Contractor's Work and report any deviations from the schedule to the Owner.
      e. Monitor, verify and document all waste load-out operations.
      f. Verify that the Contractor is performing personal air monitoring daily, and that results are being returned and posted at the site as required.

g. The APM shall maintain a log on site that documents all project related and Consultant and Contractor actions, activities and occurrences.

4. The following minimum inspections shall be conducted by the APM. Additional inspections shall be conducted as required by Project conditions. Progression from one phase of Work to the next by the Contractor is only permitted with the written approval of the APM.
   a. Pre-Construction Inspection: The purpose of this inspection is to verify the existing conditions of the Work Areas and to document these conditions.
   b. Pre-Commencement Inspection: The purpose of this inspection is to verify the integrity of each containment system prior to disturbance of any asbestos containing material. This inspection shall take place only after the Work Area is fully prepped for removal.
   c. Work Inspections: The purpose of this inspection is to monitor the Work practices and procedures employed on the Project and to monitor the continued integrity of the containment system. Inspections within the removal areas shall be conducted by the APM during all preparation, removal, and cleaning activities at least twice every Work shift. Additional inspections shall be conducted as warranted.
   d. Pre-Encapsulation Inspection: The purpose of this inspection is to ensure the complete removal of ACM, ACCM, and/or PACM, from all surfaces in the Work Area prior to encapsulation.
   e. Visual Clearance Inspection: The purpose of this inspection is to verify that: all materials in the scope of work have been properly removed; no visible asbestos debris/residue remains; no pools of liquid or condensation remains; and all required cleanings are complete. This inspection shall be conducted before final air clearance testing.
   f. Post-Clearance Inspection: The purpose of this inspection is to ensure the complete removal of ACM, including debris, from the Work Area after satisfactory final clearance sampling and removal of all isolation and critical barriers and equipment from the Work Area.
   g. Punch List Inspection: The purpose of this inspection is to verify the Contractor's certification that all Work has been completed as contracted and the existing condition of the area prior to its release to the Owner.

E. The Consultant shall provide abatement project air sampling and analysis as required by applicable regulations. Sampling will include background, Work Area preparation, asbestos handling, and final cleaning and clearance air sampling.
   1. Unless otherwise required by applicable regulations, the Consultant shall have samples analyzed by Phase Contrast Microscopy (PCM) for daily area air monitoring during asbestos removal or disturbance work. For analysis of air clearance sampling, the Consultant shall have samples analyzed at an accredited laboratory by Phase Contrast Microscopy (PCM) NIOSH 7400 methodology, for areas where asbestos is disturbed and will be re-occupied. Results shall be available at the Project site within 24 hours of completion of sampling.
   2. Samples shall be collected as required by applicable regulations and these specifications. If PCM air sample analysis results exceed the satisfactory clearance criteria, then TEM analysis of the entire set of clearance air samples may be used, provided that a standard NIOSH/ELAP/AIHA accredited laboratory is utilized. The laboratory shall report each air sample result in fibers per cubic centimeter (f/cc).
   3. If the air sampling during any phase of the abatement project reveals airborne fiber levels at or above 0.01 fibers/cc (EPA Clearance Criteria) or the established background level, whichever is greater, outside the regulated Work Area, work shall stop immediately, and corrective measures required by applicable regulations shall be initiated. The Contractor shall bear the burden of any and all costs incurred by this delay.
   4. At the completion of each abatement phase, the Environmental Consultant shall prepare an interim certificate of completion for project records.

1.09 CONTRACTOR AIR SAMPLING

A. In addition to the requirements of OSHA 1926.1101, the Contractor shall be required to perform personal air monitoring every Work shift in each Work Area during which abatement activities occur in order to determine that appropriate respiratory protection is being worn and utilized. Personal monitoring shall be conducted in accordance with OSHA personal exposure monitoring requirements.

B. The Contractor shall conduct air sampling that is representative of both the 8-hour time weighted average and 30-minute short-term exposures to indicate compliance with the permissible exposure and excursion limits.

C. The Contractor's laboratory analysis of air samples shall be conducted by an AIHA, ELAP-approved laboratory.

D. Results of personnel air sample analyses shall be available, verbally, within twenty-four (24) hours of sampling and shall be posted upon receipt. Written laboratory reports shall be delivered and posted at the Work site within forty-eight (48) hours of collection. Failure to comply with these requirements may result in all work being stopped until compliance is achieved.

1.10 PROJECT SUPERVISOR

A. The Contractor shall designate a full-time Project Supervisor who shall meet the following qualifications:
   1. The Project Supervisor shall hold an AHERA certification as an Asbestos Supervisor.
   2. The Project Supervisor shall meet the requirements of a "Competent Person" as defined by OSHA 1926.1101 and shall have a minimum of one-year experience as a supervisor.

B. The Project Supervisor must be able to speak, read, and write English fluently, as well as communicate in the primary language of the Workers and immediate community.

C. If the Project Supervisor is not on-site at any time whatsoever, all work shall be stopped. The Project Supervisor shall remain on-site until the Project is complete. The Project Supervisor cannot be removed from the Project without the written consent of the Owner and the Environmental Consultant. The Project Supervisor shall be removed from the Project if so requested by the Owner. The Project Supervisor shall maintain the bound Daily Project Log that also includes the entry/exit logs and Waste Disposal Log of the specifications.

D. The Project Supervisor shall be responsible for the performance of the work and shall represent the Contractor in all respects at the Project site. The Supervisor shall be the primary point of contact for the Asbestos Project Monitor.

1.11 MEDICAL REQUIREMENTS

A. Before exposure to airborne asbestos fibers, provide Workers with a comprehensive medical examination as required by 29 CFR 1910.1001, and 29 CFR 1926.1101.
   1. This examination is not required if adequate records show the employee has been examined as required by 29 CFR 1910.1001, and 29 CFR 1926.1101 within the past year.
   2. The same medical examination shall be given on an annual basis to employees engaged in an occupation involving asbestos fibers and within thirty (30) calendar days before or after the termination of employment in such occupations.

1.12 TRAINING

A. As required by applicable regulations, prior to assignment of asbestos work, instruct each employee with regard to the hazards of asbestos, safety and health precautions, and the use and requirements of protective clothing and personal protective equipment (PPE).

B. Establish a respirator program in accordance with ANSI Z88.2, 29 CFR 1910.134, and 29 CFR 1926.1101including respirator training and fit testing.

1.13 RESPIRATORY PROTECTION

A. Select respirators from those approved by the National Institute for Occupational Safety and Health (NIOSH), Department of Health and Human Services.

B. Respirators shall be individually fit-tested to personnel under the direction of an Industrial Hygienist on a yearly basis. Fit-tested respirators shall be permanently marked to identify the individual fitted, and use shall be limited to that individual. Fit-test records shall be maintained on site for each employee.

C. Where fiber levels permit, and in compliance with regulatory requirements, Powered Air Purifying Respirators (PAPR) are the minimum allowable respiratory protection permitted to be utilized during gross removal operations of OSHA Class I or OSHA Class II friable ACM.

D. No respirators shall be issued to personnel without such personnel participating in a respirator training program.

E. High Efficiency Particulate Air (HEPA) respirator filters shall be approved by NIOSH and shall conform to the OSHA requirements in 29 CFR 1910.134 and 29 CFR 1926.1101.

F. A storage area for respirators shall be provided by the Contractor in the clean room side of the personnel decontamination enclosure where they will be kept in a clean environment.

G. The Contractor shall provide and make available a sufficient quantity of respirator filters so that filter changes can be made as necessary during the work day. Filters will be removed and discarded during the decontamination process. Filters cannot be reused. Filters must be changed if breathing becomes difficult.

H. Filters used with negative pressure air purifying respirators shall not be used any longer than one eight (8) hour work day for friable ACM disturbance work and three (3) working shifts for non-friable ACM disturbance work.

I. Any authorized visitor, Worker, or supervisor found in the Work Area not wearing the required respiratory protection shall be removed from the Project site and not be permitted to return.

J. The Contractor shall have at least two (2) Powered Air Purifying Respirators stored on site designated for authorized visitors use. Appropriate respirator filters for authorized visitors shall be made available by the Contractor.

1.14 DELIVERY AND STORAGE

A. Deliver all materials to the job site in original packages with containers bearing manufacturer's name and label.

B. Store all materials at the job site in a suitable and designated area.
   1. Store materials subject to deterioration or damage away from wet or damp surfaces and under cover.
   2. Protect materials from unintended contamination and theft.
   3. Storage areas shall be kept clean and organized.

C. Remove damaged or deteriorated materials from the job site. Materials contaminated with asbestos shall be disposed of as asbestos debris as herein specified.

1.15 TEMPORARY UTILITIES

A. Shut down and lock out all electrical power to the asbestos Work Areas.

B. Provide temporary 120-240 volt, single phase, three wire, 100 amp electric service with Ground Fault Circuit Interrupters (GFCI) for all electric requirements within the asbestos Work Area.
   1. Where available, obtain from Owner's existing system. Otherwise provide power from other sources (i.e. generator).
   2. Provide temporary wiring and "weatherproof" receptacles in sufficient quantity and location to serve all HEPA equipment and tools.
   3. Provide wiring and receptacles as required by the Environmental Consultant for air sampling equipment.

4. All power to the Work Area shall be brought in from outside the area through GFCI's at the source.

C. Provide temporary lighting with "weatherproof" fixtures for all Work Areas including decontamination chambers.
   1. The entire Work Area shall be kept illuminated at all times.
   2. Provide lighting as required by the Environmental Consultant for the purposes of performing required inspections.

D. All temporary devices and wiring used in the Work Area shall be capable of decontamination procedures including HEPA vacuuming and wet-wiping.

E. Utilize domestic water service, from Owner's existing system. Provide hot water heaters with sufficient capacity to meet Project demands.

PART 2 - PRODUCTS

1.16 PROTECTIVE CLOTHING

A. Provide personnel utilized during the Project with disposable protective whole-body clothing, head coverings, gloves and foot coverings. Provide disposable plastic or rubber gloves to protect hands. Cloth gloves may be worn inside the plastic or rubber for comfort but shall not be used alone. Make sleeves secure at the wrists and make foot coverings secure at the ankles by the use of tape or provide disposable coverings with elastic wrists or tops.

B. Provide sufficient quantities of protective clothing to assure a minimum of four (4) complete disposable outfits per day for each individual performing abatement Work.

C. Eye protection and hard hats shall be provided and made available for all personnel entering any Work Area.

D. Authorized visitors shall be provided with suitable protective clothing, headgear, eye protection, and footwear whenever they enter the Work Area.

1.17 SIGNS AND LABELS

A. Provide bilingual (English-Spanish) warning signs and barrier tapes at all approaches to asbestos Work Areas. Locate signs at such distance that personnel may read the sign and take the necessary protective steps required before entering the area.
   1. Provide danger signs in vertical format conforming to 29 CFR 1926.1101, minimum 20" x 14" displaying the following legend.

      DANGER
      ASBESTOS CANCER AND LUNG DISEASE HAZARD
      AUTHORIZED PERSONNEL ONLY
      RESPIRATORS AND PROTECTIVE CLOTHING
      ARE REQUIRED IN THIS AREA

   2. Provide 3" wide OSHA-Approved barrier tape printed with black lettered, "DANGER ASBESTOS REMOVAL". Locate barrier tape across all corridors, entrances and access routes to asbestos Work Area. Install tape 3' to 4' AFF.

B. Provide asbestos danger labels affixed to all asbestos materials, scrap, waste, debris and other products contaminated with asbestos.
   1. Provide asbestos danger labels of sufficient size to be clearly legible, displaying the following legend:

      DANGER
      CONTAINS ASBESTOS FIBERS
      AVOID CREATING DUST
      CANCER AND LUNG DISEASE HAZARD

2. Provide the following asbestos labels, of sufficient size to be clearly legible, for display on waste containers (bags or drums) which will be used to transport asbestos contaminated material in accordance with United States Department of Transportation 49 CFR Parts 171 and 172: (Note: Include “RQ” for friable asbestos waste only.)
   RQ, (WASTE) ASBESTOS, 9, NA2212, PGIII
3. Generator identification information shall be affixed to each waste container indicating the following printed in indelible ink:
   Generator Name
   Facility Name
   Facility Address
   EPA Generator ID Number

1.18 DAILY PROJECT LOG

A. Provide a Daily Project Log. The log shall contain on title page the Project name, name, address and phone number of Owner; name, address and phone number of Environmental Consultant; name, address and phone number of Abatement Contractor; emergency numbers including, but not limited to local Fire/Rescue department and all other requirements.

B. All entries into the log shall be made in non-washable, permanent ink and such pen shall be strung to or otherwise attached to the log to prevent removal from the log-in area. Under no circumstances shall pencil entries be permitted.

C. All persons entering and exiting the Work Area shall sign the log and include name, social security number, and time.

D. The Project Supervisor shall maintain entry log records and ensure that they are completed daily and available for review at all times.

1.19 SCAFFOLDING AND LADDERS

A. Provide scaffolding and/or staging as necessary to accomplish the work of this Contract. Scaffolding may be of suspension type or standing type such as metal tube and coupler, tubular welded frame, pole or outrigger type or cantilever type. All scaffolding shall be designed and constructed in accordance with OSHA and any other applicable federal, state and local government regulations. Whenever there is a conflict or overlap of the above references the most stringent provisions are applicable.

B. Provide scaffolding and ladders as required by the Environmental Consultant for the purposes of performing required inspections.

1.20 SURFACTANT (AMENDED WATER)

A. Wet all asbestos-containing materials prior to removal with surfactant mixed into the water and applied in accordance with manufacturer's printed instructions.

1.21 ENCAPSULANT

A. Encapsulant shall be tinted or pigmented so that application when dry is readily discernible.

B. Only encapsulants rated as acceptable or marginally acceptable on the basis of Battelle Columbus Laboratory test procedures and rating requirements developed under the 1978 US EPA Contract shall be used for lockdown encapsulation.

C. The encapsulant solvent shall not contain a volatile hydrocarbon.

D. Latex paint with solids content greater than 15 percent shall be considered a lockdown sealant for coating all non-metallic surfaces.

1.22 SOLVENT/MASTIC REMOVERS

A. Mastic remover solvents shall be “low-odor” and no VOCs, Grayling Industries Control Green (or approved equal).

B. The solvent shall be stored, handled, applied and used according to manufacturer instructions.

1.23 FOAM/VISCOUS LIQUID

A. Foam or viscous liquid shall be non-toxic, shall not require special respirator protection for handling, and shall not affect the handling and disposal of the asbestos waste.

B. Foam or vicious liquid shall leave an identifiable colored residue when it dissipates.

1.24 DISPOSAL BAGS, DRUMS, AND CONTAINERS

A. Provide 6 mil polyethylene disposal bags printed with asbestos caution labels. Bags shall also be imprinted with U.S. Department of Transportation required markings.

B. Provide 30 or 55-gallon capacity fiber, plastic or metal drums capable of being sealed air and water-tight if asbestos waste disposal bags have the potential to be damaged or punctured during abatement and disposal activities. Affix asbestos caution labels on lids and at one-third points around drum circumference to assure ready identification.

C. Containers and bags must be labeled accordance with 40 CFR Part 61 NESHAPS and applicable regulations. When the bags/containers are moved to the lockable hardtop dumpster from the waste decontamination system washroom, the bags must also be appropriately labeled with the date they are moved on the bag/container in waterproof markings.

D. Labeled ACM waste containers or bags shall not be used for non-ACM waste or trash. Any material placed in labeled containers or bags, whether turned inside out or not shall be handled and disposed of as ACM waste.

1.25 HEPA VACUUM EQUIPMENT

A. Dry vacuuming performed under this contract shall be performed with High Efficiency Particulate Absolute (HEPA) filter equipped industrial vacuums conforming to ANSI Z9.2.

B. Provide tools and specialized equipment including scraping nozzles with integral vacuum hoods connected to a HEPA vacuum with flexible hose.

1.26 POWER TOOLS

A. Any power tools used to drill, cut into, or otherwise disturb asbestos material shall be manufacturer equipped with HEPA filtered local exhaust ventilation.

1.27 POLYETHYLENE SHEETING

A. All polyethylene (plastic) sheeting used on the Project (including but not limited to sheeting used for critical and isolation barriers, fixed objects, walls, floors, ceilings and waste container) shall be at least 6 mil fire retardant sheeting.

B. Decontamination enclosure systems shall utilize at least 6-mil opaque fire retardant plastic sheeting. At least 2 layers of 6 mil reinforced fire-retardant plastic sheeting shall be used for the flooring.

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

A. Should visible emissions or water leaks be observed outside the Work Area, immediately stop work and institute emergency procedures per applicable regulations. Should there be elevated fiber levels outside the Work Area, immediately stop work and institute emergency procedures per applicable regulations. All costs incurred in decontaminating such non-Work Areas and the contents thereof shall be borne by the Contractor, at no additional cost to the Owner.

B. Current medical approval, fit test reports, Worker Acknowledgments, and asbestos training certificates shall be on site prior to admittance of any Contractor’s employees to the asbestos Work Area. Workers or supervisors failing to provide proof of such current documents will be required to leave the job site.

C. The following submittals, documentation, and postings shall be maintained on-site by the Contractor during abatement activities at a location approved by the Abatement Project Monitor:

1. Contractor license issued by the California State Licensing Board and DOSH.
2. Certification, Worker Training, Medical Surveillance, Acknowledgments:
   a. AHERA certification cards for each person employed in the removal, handling, or disturbance of asbestos.
   b. Evidence that Workers have received proper training required by the regulations and the medical examinations required by OSHA 29 CFR 1926.1101.
   c. Documentation that Workers have been fit tested specifically for respirators used on the Project.
   d. Worker's Acknowledgments: Statements signed by each employee that the employee has received training in the proper handling of asbestos containing materials; understands the health implications and risks involved; and understands the use and limitations of the respiratory equipment to be used.
3. Daily OSHA required personal air monitoring results.
4. AIHA and ELAP certification for the laboratory that will be analyzing the OSHA required personnel air samples.
5. California State Waste Transporter Permit.
6. Project documents (specifications and drawings).
7. Notifications, Variances, Asbestos Work Permit, Work Place Safety Plan. Ensure that the most up-to-date notifications and Variances (if any) are on-site.
8. Applicable regulations.
9. Material Safety Data Sheets of supplies/chemicals used on the Project.
10. Approved Abatement Work Plan.
11. List of emergency telephone numbers.
12. Magnahelic manometer semi-annual calibration certification.
13. Waste Disposal Log.
14. Daily Project Log.

D. The following documentation shall be maintained on-site by the Abatement Project Monitor during abatement activities:
   1. Contractor licenses issued by Governing agencies in the State of California (CSLB, DOSH).
   2. Air Sample Log
   3. Air sample results
   4. Project Monitor Daily Log
   5. Asbestos Survey Report.
   6. A copy of ASTM Standard E1368 “Standard Practice for Visual Inspection of Asbestos Abatement Projects.”

E. The Work Area must be vacated by building occupants prior to decontamination enclosure construction and Work Area preparation.

F. Install emergency exit signage and fire extinguishers throughout the Work Area in accordance with OSHA Construction Industry Standards.

G. All demolition necessary to access asbestos containing materials for removal, or other work in which disturbance to ACM/ACCM/PACM is likely to occur, must be conducted within negative pressure enclosures by licensed asbestos handlers. Demolition debris may be disposed of as construction and demolition debris provided the Abatement Project Monitor determines that it is not contaminated with asbestos and there has been no disturbance of ACM within the enclosure. If the demolition debris is determined to be contaminated or ACM has been disturbed, it must be disposed of as asbestos waste.

3.02 PERSONNEL DECONTAMINATION ENCLOSURE

A. Provide personnel decontamination enclosure contiguous to the Work Area. The decontamination enclosure shall be attached to the Work Area and not located within it unless isolation barriers are installed. If the decontamination chamber is accessible to the public it shall be fully framed, sheathed, and lockable to prevent unauthorized entry.

B. Access to the Work Area will be from the clean room through an air-lock to the shower and through an air lock to the equipment room. Each airlock shall be a minimum of three feet from door to door. Additional air locks shall be provided as required by applicable regulations for remote decontamination enclosures.

C. The decontamination enclosure ceiling and walls shall be covered with one layer of opaque 6 mil (minimum) polyethylene sheeting. Two layers of reinforced polyethylene sheeting shall be used to cover the floor.

D. The entrance to the clean room shall have a lockable door. Provide suitable lockers for storage of Worker's street clothes. Storage for respirators along with replacement filters and disposable towels shall also be provided.

E. Provide a temporary shower with individual hot and cold-water supplies and faucets. Provide a sufficient supply of soap and shampoo. There shall be one shower for every six Workers. The shower room shall be constructed in such a way so that travel through the shower chamber shall be through the shower. The shower shall not be able to be bypassed.

F. Shower water shall be drained, collected and filtered through a system with at least a 5.0-micron particle size collection capability containing a series of several filters with progressively smaller pore sizes to avoid rapid clogging of the system. The filtered waste water shall then be discharged in accordance with applicable codes and the contaminated filters disposed of as asbestos waste. A supply of filter changes shall be maintained on site and spent filters changed as needed to maintain water drainage efficiency. Filtered water shall be discharged to municipal sewer only.

G. The equipment room shall be used for the storage of tools and equipment. A walk-off pan filled with water shall be located in the Work Area outside the equipment room for Workers to clean foot coverings when leaving the Work Area. A labeled 6-mil plastic ACM waste bag for collection of contaminated clothing shall be located in this room.

H. The personal decontamination enclosure shall be cleaned and disinfected minimally at the end of each Work shift and as otherwise directed by the Asbestos Project Monitor.

3.03 WASTE DECONTAMINATION ENCLOSURE

A. As a rule, the Contractor shall provide a waste decontamination enclosure contiguous to the Work Area at all times. Use of remote decontamination units should not be permitted unless special circumstances prevent such a design. The decontamination enclosure shall be attached to the Work Area and not located within it unless isolation barriers are installed. If the decontamination chamber is accessible to the public, it shall be fully framed and sheathed to prevent unauthorized entry.

B. The waste decontamination enclosure system shall consist of a holding area, air lock and washroom. The airlock shall be a minimum of three feet from door to door. The entrance to the holding area shall have a lockable door.

C. The decontamination enclosure ceiling and walls shall be covered with one layer of opaque 6 mil (minimum) polyethylene sheeting on walls and ceiling. Two layers of reinforced polyethylene sheeting shall be used to cover the floor.

D. Where there is only one egress from the Work Area, the holding area of the waste decontamination enclosure system may branch off from the personnel decontamination enclosure equipment room, which then serves as the waste wash room.

E. The waste wash room water shall be drained, collected, and filtered through a system with at least a 5.0-micron particle size collection capability containing a series of several filters with progressively smaller pore sizes to avoid rapid clogging of the system. The filtered waste water shall then be discharged in accordance with applicable codes and the contaminated filters disposed of as asbestos waste. An adequate supply of filters shall be maintained on site and filters replaced as needed.

F. In small asbestos Projects where only one egress from the Work Area exists, the shower room may be used as a waste washroom. In this instance, the clean room shall not be used for waste

storage, but shall be used for waste transfer to carts, which shall immediately be removed from this enclosure.

3.04 WORK AREA ENTRY AND EXIT PROCEDURES

A. Access to and from the asbestos Work Area is permitted only through the personnel decontamination enclosure unless otherwise stipulated in a variance.

B. Workers shall sign the entry/exit log upon every entry and exit.

C. The following procedures shall be followed when entering the Work Area:
   1. Before entering the Work Area, Workers shall proceed to the clean room, remove all street clothes, and don protective clothing, equipment and respirators.
   2. Workers shall proceed from the clean room through the shower room and the equipment room and into the Work Area.

D. The following procedures shall be followed when exiting the Work Area:
   1. Before leaving the Work Area, gross asbestos contamination will be removed by brushing, wet cleaning and/or HEPA vacuuming.
   2. In the equipment room, Workers shall remove disposable clothing, but not respirators, and shall place clothing in plastic disposal bags for disposal as contaminated debris prior to entering the shower room.
   3. Workers shall shower thoroughly while wearing respirators then wash respirator with soap and water prior to removal.
   4. Upon exiting the shower, Workers shall don new disposable clothing if the Work shift is to continue or street clothes to exit area. Under no circumstances shall Workers enter public non-Work Areas in disposable protective clothing.

E. If remote decontamination enclosures are permitted by applicable regulations or a Variance, workers shall wear two disposable suits for all phases of Work. Workers exiting the Work Area shall HEPA vacuum the outer suit, enter the airlock, remove the outer suit and then place it back into the Work Area. A clean second suit shall be donned before exiting the airlock and proceeding to the decontamination enclosure or another Work Area.

3.05 WORK AREA PREPARATION

A. Asbestos danger signs shall be posted at all approaches to the asbestos Work Area. Post all emergency exits as emergency exits only on the Work Area side. Post with asbestos caution signs on the non-Work Area side. Provide all non-Work Area stairs and corridors accessible to the asbestos Work Area with warning tapes at the base of stairs and beginning of corridors. Warning tapes shall be in addition to caution signs.

B. Shut down and lock out the building heating, ventilating, and air conditioning systems. Electrical systems and circuits shall also be shut down unless permitted to remain active per applicable regulations and appropriately protected and labeled. Existing lighting sources shall not be utilized. Provide temporary electric power and lighting as specified herein.

C. All surfaces and objects within the Work Area shall be pre-cleaned using HEPA vacuuming and/or wet-wiping methods. Dry sweeping and any other methods that raise dust shall be prohibited. ACM shall not be disturbed during pre-cleaning.

D. Movable objects within the Work Area shall be HEPA vacuumed and/or wet-wiped and removed from the Work Area.

E. All non-movable equipment in the Work Area shall be completely covered with 2 layers of polyethylene sheeting, at least 6-mil in thickness, and secured in place with duct tape and/or spray adhesive.

F. Provide enclosure of the asbestos Work Area necessary to isolate it from unsealed areas of the building in accordance with the approved asbestos Work Plan and as specified herein.

G. Provide critical barriers by sealing off all openings including but not limited to windows, diffusers, grills, electrical outlets and boxes, doors, floor drains and any other penetrations of the Work Area enclosure, using 2 layers of at least 6 mil polyethylene sheeting.

H. Provide isolation barriers by installing temporary framing and sheathing at openings larger than 32 square feet forming the limits of the asbestos Work Area. Sheathing thickness must be a minimum of 3/8 inch (minimum) and all sheathing shall be caulked, and the Work Area side sealed with two layers of 6 mil polyethylene sheeting.

I. Isolation barriers shall be installed at all elevator openings (if elevators are present) in the Work Area. Elevators running through the regulated abatement Work Area shall be shut down or isolated as per applicable regulations. Elevator controls shall be modified so that elevators bypass the Work Area.

J. Provide two layers of 6 mil (minimum thickness) polyethylene sheeting over all floor, wall and ceiling surfaces. Isolation barriers shall also be covered with two layers (for a total of four layers). Sheeting shall be secured with spray adhesive and then sealed with duct tape. All joints in polyethylene sheeting shall overlap 12" minimum. Carpeting left in place shall be covered with 3/8 inch plywood (minimum thickness) sheathing prior to plasticizing.

K. Unless otherwise specified for removal, the Contractor shall either protect all fiberglass insulation on piping, ductwork, tanks, etc. in the Work Area using two layers of six mil polyethylene or remove the insulation as asbestos containing waste. If the Contractor elects to remove the fiberglass insulation, he shall be responsible for reinsulation of removed ACM if part of the Contract or Project.

L. Frame out emergency exits. Provide double layer 6 mil polyethylene sheeting and tape seal opening. Post as emergency exits only and mark with photoluminescent paint or signage. Provide a cutting tool on the Work Area side of exit.

M. Remove all items attached to or in contact with ACM only after the Work Area enclosure is in place. HEPA vacuum and wet wipe with amended water all removed items prior to their removal from the Work Area and before the start of asbestos removal operations.

N. Suspended ceiling tiles shall only be removed after Work Area preparation is complete. If possible, non-contaminated ceiling tiles shall be HEPA vacuumed and removed from the Work Area before asbestos removals begin. Contaminated ceiling tiles shall be disposed of as asbestos waste.

3.06 NEGATIVE AIR PRESSURE FILTRATION SYSTEM

A. Provide a portable asbestos air filtration system that develops a minimum pressure differential of negative 0.02 in. of water column (w.g.) within all full enclosure areas relative to adjacent unsealed areas and that provides a minimum of 4 air changes per hour in the Work Area during abatement and 2 air changes for non-friable flooring and/or mastic removal.

B. Such filtration systems must be made operational after critical and isolation barriers are installed but before wall, floor, and ceilings are plasticized and shall be operated 24 hours per day during the entire Project until the final cleanup is completed, and satisfactory results of the final air samples are received from the laboratory.

C. The system shall include a series of pre-filters and filters to provide High Efficiency Particulate Air (HEPA) filtration of particles down to 0.3 microns at 100% efficiency and below 0.3 microns at 99.97% efficiency. Provide sufficient replacement filters to replace pre-filters every 2 hours, secondary pre-filters every 24 hours, and primary HEPA filters every 600 hours of operation.

D. A minimum of one additional filtration unit of at least the same capacity as the primary unit(s) shall be installed and fully functional to be used during primary unit (s) filter changing and in case of primary failure.

E. If the containment area includes either the entire floor of the building or an area greater than 15,000 sq. ft. in any single space, install a negative air cut off switch in the clean room of the decontamination unit.

F. Upon electric power failure or shut-down of any filtration unit, all abatement activities shall stop immediately and only resume after power is restored and all filtration units are fully operating. For shut-downs longer than one half hour, all openings into the Work Area, including the decontamination enclosures, shall be sealed.

G. The Contractor shall provide a manometer to verify negative air pressure. Manometers shall be continuous-read with digital display and operated in the “recording mode”. Documented readings shall be maintained with the Daily Project Log.

H. There shall be at least a 4-hour settling period after the Work Area is fully prepared and the negative filtration units have been started to ensure integrity of the barriers.

I. Once installed and operational, the Contractor’s Supervisor shall conduct daily inspections of the Work Area to insure the airtight integrity of the enclosure and operation of the negative air system. Findings shall be recorded within the Daily Project Log. Inspections shall also be conducted on days when no abatement activities are in progress.

3.07 REMOVAL OF ASBESTOS CONTAINING MATERIALS

A. Asbestos-containing materials shall be removed in accordance with the Contract Documents and the approved Asbestos Work Plan. Only one type of ACM shall be abated at a time within a Work Area. Where there are multiple types of ACM requiring abatement, applicable regulations procedures for sequential abatement shall be followed.

B. Sufficiently wet asbestos materials with a low pressure, airless fine spray of surfactant to ensure full penetration prior to material removal. Re-wet material which does not display evidence of saturation.

C. One Worker shall continuously apply amended water while ACM is being removed.

D. Perform cutting, drilling, abrading or any penetration or disturbance of asbestos containing material in a manner to minimize the dispersal of asbestos fibers into the air. Use equipment and methods specifically designed to limit generation of airborne asbestos particles. All power operated tools used shall be provided with HEPA equipped filtered local exhaust ventilation.

E. Upon removal of ACM from the substrate, the newly exposed surfaces shall be HEPA vacuumed and/or wet cleaned. Surfaces must be thoroughly cleaned using necessary methods and any required solvents to completely remove any adhesive, mastic, etc.

F. All removed material and debris shall be promptly cleaned up and placed into 6 mil plastic disposal bags or other suitable container upon detachment from the substrate. ACM is not permitted to lie on the floor for any period of time.

G. Large components shall be wrapped in two layers of 6 mil polyethylene sheeting. Sharp components likely to tear disposal bags shall be placed in fiber drums or boxes and then wrapped with sheeting.

H. Power or pressure washers are not permitted for asbestos removal or clean-up procedures unless approved in a Variance.

I. All open ends of pipe and duct insulation not scheduled for removal shall be encapsulated using lag cloth.

J. All construction and demolition debris determined by the Environmental Consultant to be contaminated with asbestos shall be handled and disposed of as asbestos waste.

K. The use of metal shovels, metal dust pans, brooms, and compressed air, etc. are not permitted inside an asbestos regulated Work Area.

3.08 WASTE CONTAINER DECONTAMINATION & REMOVAL PROCEDURES

A. External surfaces of contaminated containers and equipment shall be cleaned by wet cleaning and/or HEPA vacuuming in the Work Area before moving such items into the waste decontamination enclosure system airlock by persons assigned to this duty. The persons in the Work Area shall not enter the airlock. No gross removal operations are permitted when waste transfer is in progress.

B. The containers and equipment shall be removed from the airlock by persons stationed in the washroom during waste removal operations. The external surfaces of containers and equipment shall be cleaned a second time by wet cleaning.

C. The cleaned containers of asbestos material and equipment are to be dried of any excessive pooled or beaded liquid, placed in uncontaminated 6 mil plastic bags or sheeting, as the item's physical characteristics demand, and sealed airtight.

D. The clean containerized items shall be moved into the airlock that leads to the holding area. Workers in the washroom shall not enter this airlock.

E. Containers and equipment shall be moved from the airlock and into the holding area by persons dressed in clean personal protective equipment, who have entered from the holding area.

F. The cleaned containers of asbestos material and equipment shall be placed in water tight carts with doors or tops that shall be closed and secured. These carts shall be held in the holding area pending removal. The carts shall be wet cleaned and/or HEPA vacuumed at least once each day.

G. The exit from the decontamination enclosure system shall be secured to prevent unauthorized entry.

H. Where the waste removal enclosure is part of the personnel decontamination enclosure, waste removal shall not occur during shift changes or when otherwise occupied. Precautions shall be taken to prevent short circuiting and cycling of air outward through the shower and clean room.

3.09 DECONTAMINATION, CLEANING, AND CLEARANCE PROCEDURES

A. Following completion of gross abatement and after all accumulations of asbestos waste materials have been containerized, the following decontamination procedures shall be followed.

B. First Cleaning:
   1. All bagged asbestos waste and unnecessary equipment shall be decontaminated and removed from the Work Area.
   2. All surfaces in the Work Area shall be wet cleaned. A wet-purpose shop vacuum may be used to pick up excess liquid and may either be decontaminated prior to removal from the Work Area or disposed of as asbestos waste.
   3. The Abatement Project Monitor shall conduct a visual inspection of the Work Area for cleanliness and completion of abatement.
   4. The Contractor shall then apply a thin coat of encapsulant to all surfaces in the Work Area that were not the subject of removal. In no event shall encapsulant be applied to any surface that was the subject of removal prior to obtaining satisfactory air monitoring results. Owner reserves the right to request encapsulants to be pigmented or tinted to provide an indication for completeness of coverage. The Abatement Project Monitor shall determine adequacy of coverage.
   5. After the encapsulant has been applied and the required waiting/settling and drying time has elapsed, the first layer of polyethylene sheeting shall then be removed and bagged.

C. Second Cleaning
   1. All surfaces in the Work Area shall be HEPA vacuumed and then wet cleaned.
   2. The Abatement Project Monitor shall conduct a second visual inspection of the Work Area for cleanliness.
   3. After the required waiting/settling and drying time has elapsed, the second layer of polyethylene sheeting shall be removed and bagged.

D. Third Cleaning
   1. All surfaces in the Work Area shall be HEPA vacuumed and then wet cleaned.
   2. The Abatement Project Monitor shall conduct a third visual inspection of the Work Area for cleanliness.
   3. After the required waiting/settling and drying time has elapsed, aggressive final clearance air sampling shall then be conducted by the Environmental Consultant provided no visible asbestos debris/residue; pools of liquid, or condensation remains.
   4. Upon receipt of satisfactory final clearance air sampling results, the negative air pressure equipment can be shut down and the isolation and critical barriers removed. Following

this, the decontamination enclosures shall be removed.

E. After isolation and critical barriers are removed, the Abatement Project Monitor and Contractor's Supervisor shall inspect the Work Area for cleanliness. If necessary, additional cleaning shall be performed by the Contractor as directed by the Abatement Project Monitor.

F. As a result of any visual inspection by the Asbestos Project Monitor or should air sampling results indicate elevated airborne fiber levels, the Contractor will clean or reclean the affected areas at no additional expense to the Owner.

3.10 TENT ENCLOSURES

A. Tent enclosures may only be used under special circumstances where conventional full containment systems cannot be constructed and if used, will require approval by the local APCD and Environmental Consultant, in writing.

B. The Contractor shall restrict access to the immediate area where tent removal procedures are taking place using barrier tape and/or construction barriers. Caution signs shall be posted.

C. Personnel and waste decontamination enclosures shall be constructed. Configuration shall be as required by Project size.

D. The Work Area shall be precleaned. All objects and equipment that will remain in the restricted area during abatement shall be sealed with two layers of six mil polyethylene and tape.

E. The tent shall be a single use barrier constructed with a rigid frame and at least two layers of six mil polyethylene unless one layer of six mil polyethylene is otherwise permitted by applicable regulations. All seams shall be sealed airtight using duct tape and/or spray adhesive.

F. The tent shall be constructed with at least one airlock for worker/waste egress.

G. A monometer shall be used for all enclosures.

H. Negative air shall be maintained at four (4) air changes per hour for non-friable and glove-bag abatement tent enclosure Work Areas.

I. OSHA compliance air monitoring is required per section 1.9.

J. ACM removal shall follow procedures defined in section 3.7.

K. Waste material shall be placed in properly labeled 6 mil plastic bags or other appropriate containers. The outside of the bags or containers shall be wet wiped and/or HEPA vacuumed and shall then be placed in a second bag/container before being transported to the waste storage container. All transportation of waste bags and containers outside the Work Area shall be in watertight carts. These carts shall be held in the holding area pending removal. The carts shall be wet cleaned and/or HEPA vacuumed at least once each day.

L. Following completion of gross abatement and after all accumulations of asbestos waste materials have been containerized, the following decontamination procedures shall be followed.
   1. All bagged asbestos waste and unnecessary equipment shall be decontaminated and removed from the Work Area.
   2. All surfaces in the Work Area shall be wet cleaned. A wet-purpose shop vacuum may be used to pick up excess liquid and shall be decontaminated prior to removal from the Work Area.
   3. Asbestos Project Monitor shall conduct a visual inspection of the Work Area for cleanliness and completion of abatement.
   4. After the waiting/settling and drying time requirements have elapsed, final clearance air sampling shall be conducted by the Environmental Consultant. For buildings regulated under the AHERA asbestos regulations, aggressive clearance sampling methods and Transmission Electron Microscopy (TEM) clearance and lab analytical methods and criteria must be used.
   5. Upon receipt of satisfactory final clearance air sampling results, the containment shall be collapsed into itself, placed in suitable disposal bags, and transported to the waste disposal container. Isolation and critical barriers shall then be removed.

3.11 GLOVEBAG REMOVAL

A. Glovebag removals may only be used as specifically permitted by applicable regulations for removal of asbestos piping insulations only. If glove bags are used in indoor environments, the immediate area shall be isolated using critical barriers and a decontamination unit shall be installed at the entry way to the regulated Work Area.

B. In addition to conformance with applicable regulations and Variances, glove-bag removals are only permitted to be conducted within full containments or tent enclosures complying with these specifications.

C. The Contractor shall restrict access to the immediate area where tent/glove-bag removal procedures are taking place using critical barriers, barrier tape, and/or construction barriers. OSHA warning signs shall be posted.

D. Personnel and waste decontamination enclosures shall be constructed. Configuration shall be as required by Project size.

E. Glovebag removals shall utilize commercially available glove-bags of at least six mil thickness. Use shall be in accordance with the manufacturer's instructions and the following minimum requirements:
   1. The sides of the glove-bag shall be cut to fit the size pipe being removed. Tools shall be inserted into the attached tool pocket.
   2. The glove-bag shall be placed around the pipe and the open edges shall be folded and sealed with staples and duct tape. The glove-bag shall also be sealed at the pipe to form a tight seal.
   3. Openings shall be made in the glove-bag for the wetting tube and HEPA vacuum hose. The opening shall be sealed to form a tight seal.
   4. All glove-bags shall be smoke tested by the Asbestos Project Monitor under negative pressure using the HEPA vacuum before removal operations commence. Glove-bags that do not pass the smoke test shall be resealed and then retested.
   5. After first wetting the materials to be removed, removal may commence. ACM shall be continuously wetted. After removal of the ACM, the piping shall be scrubbed or brushed so that no visible ACM remains. Open ends of pipe insulation shall be encapsulated.
   6. After the piping is cleaned, the inside of the glove-bag shall be washed down and the wetting tube removed. Using the HEPA vacuum, the glove-bag shall be collapsed and then twisted and sealed with tape with the ACM at the bottom of the bag.
   7. A disposal bag shall be placed around the glove-bag that is then detached from the pipe. The disposal bag is then sealed and transported to the decontamination enclosure.

F. After glove-bag removals are complete, containment/tent decontamination procedures shall be followed.

3.12 REMOVALS OF EXTERIOR NON-FRIABLE ACM AND/OR ACCM

Except as modified by this section, removal of exterior non-friable ACM or ACCM shall conform to all provisions of this specification.

A. Unless Variances have been otherwise obtained, removals shall be conducted in accordance with the provisions of applicable regulations.

B. The Work Area shall be the area from which ACM and ACCM are being removed and shall extend 25 feet from the perimeter of the removal area. OSHA asbestos Work Area warning signs shall be posted at perimeters of regulated Work Areas on all sides and at least every 25 feet.

C. Where ACM and/or ACCM are removed, at minimum of one layer of drop poly sheeting shall be installed to protect surfaces, landscape or other exterior features to remain. The poly sheeting shall be at least 6-mil in thickness, extend at least 20 feet out from ACM/ACCM impact areas, and be secured with perimeter weights, duct tape, sand bags, or similar to prevent drop poly sheeting from blowing away during work.

D. Non-certified Workers are not allowed in the Work Area until the Work Area is cleared by the Asbestos Project Monitor.

E. Personnel and waste decontamination enclosures shall be constructed at a location in accordance with the approved Work Plan and applicable regulations. Unless located outside the Work Area, decontamination enclosures are not permitted to be constructed on the roof.

F. All openings (including but not limited to operable windows, doors, hatches, vents, ducts, and grilles) one story above, one story below, and within 25 feet of the Work Area shall be sealed with two layers of six mil (minimum thickness) polyethylene sheeting.

G. The removal of the ACM may require the use of scrapers, solvents, mastic removal chemicals, or other methods/procedures to ensure complete removal.

H. The Contractor is required to provide temporary protection of the building (i.e. roof, window openings, construction joints, etc.) at the end of each Work shift so as to maintain the building in a watertight condition.

I. Dumpsters used for waste storage shall be lined with two layers of six mil polyethylene and shall have a hard top. Where open-top dumpsters are permitted by a Variance, the top shall be closed with polyethylene flaps that are sealed at the end of each work shift.

J. Personal protective equipment, including respirators, shall be utilized and worn during all removal operations until the Work Area is cleared by the Asbestos Project Monitor.

K. If air samples collected during abatement indicate any airborne asbestos fiber concentration(s) at or above 0.01 f/cc or established background levels, Work shall be stopped immediately, and Work methods and/or engineering controls shall be altered to reduce the airborne asbestos fiber concentration(s).

L. Following completion of gross abatement and after all accumulations of asbestos waste materials have been containerized, the following decontamination procedures shall be followed:
   1. All surfaces in the Work Area shall be HEPA vacuumed and then wet cleaned.
   2. The Asbestos Project Monitor shall conduct a visual inspection of the Work Area for cleanliness prior to conducting final air clearance.
   3. Upon satisfactory results, the isolation and critical barriers shall be removed. Following this, the decontamination enclosures shall be removed.

3.13 NON-FRIABLE FLOORING AND/OR MASTIC REMOVAL

A. The following procedures may only be used for the removal of non-friable flooring and/or mastic materials using manual and chemical methods. These procedures shall not apply to bead-blaster use, mechanical buffers, or other abrasive abatement methods.

B. The Contractor shall restrict access to the immediate area where removals are taking place using barrier tape and/or construction barriers. Caution signs shall be posted.

C. Personnel and waste decontamination enclosures shall be utilized and shall be constructed at a location in accordance with the approved Work Plan.

D. The Work Area shall be prepared per applicable regulations, minimum Class II OSHA removal procedures with critical barrier seals over all openings to the Work Area(s).

E. Negative air shall be maintained at six (6) air changes per hour.

F. OSHA compliance air monitoring is required per section 1.9.

G. ACM removal shall follow procedures defined in section 3.7.

H. Waste material shall be placed in properly labeled 6 mil plastic bags or other appropriate containers. The outside of the bags or containers shall be wet wiped and/or HEPA vacuumed before being passed into the airlock for double-bagging. The bags or containers shall then be transported to the waste storage container. All transportation of waste bags and containers outside the Work Area shall be in watertight carts.

I. Following completion of gross abatement and after all accumulations of asbestos waste materials have been containerized, the following decontamination procedures shall be followed.

1. All bagged asbestos waste and unnecessary equipment shall be decontaminated and removed from the Work Area.
2. All surfaces in the Work Area shall be wet cleaned. A wet-purpose shop vacuum may be used to pick up excess liquid and shall be decontaminated prior to removal from the Work Area.
3. The Asbestos Project Monitor shall conduct a visual inspection of the Work Area for cleanliness and completion of abatement.
4. The Contractor shall then apply a thin coat of encapsulant to all non-removal surfaces covered with plastic in the Work Area. In no event shall encapsulant be applied to any surface that was the subject of removal prior to obtaining satisfactory air monitoring results. The Owner reserves the right to request encapsulants to be pigmented or tinted to provide an indication for completeness of coverage. The Asbestos Project Monitor shall determine adequacy of coverage.
5. After the encapsulant has been applied and the required waiting/settling and drying time has elapsed, aggressive final clearance air sampling shall then be conducted by the Environmental Consultant.
6. Upon receipt of satisfactory final clearance air sampling results, the isolation and critical barriers shall be removed. Following this, the decontamination enclosures shall be removed.

3.14 RESTORATION OF UTILITIES, FIRESTOPPING, AND FINISHES

A. A final inspection of abatement areas shall be performed, attended by the Contractor, Environmental Consultant, and Owner’s representative.

B. After final clearance, remove locks and restore electrical and HVAC systems. All temporary power shall be disconnected, power lockouts removed, and power restored. All temporary plumbing shall be removed. Coordinate utility restoration with the General Contractor.

C. Finishes damaged by asbestos abatement activities including, but not limited to, plaster/paint damage due to duct tape and spray adhesives, and floor tile lifted due to wet or humid conditions, shall be restored prior to final payment.
   1. Finishes unable to be restored shall be replaced under this Contract.
   2. All foam and expandable foam products and materials used to seal Work Area openings shall be completely removed upon completion of abatement activities.

D. All penetrations (including, but not limited to, pipes, ducts, etc.) through fire rated construction shall be firestopped using materials and systems tested in accordance with ASTM E814 on Projects where reinsulation is part of the required work.

PART 4 - DISPOSAL OF ASBESTOS WASTE

4.01 TRANSPORTATION AND DISPOSAL SITE

A. The Contractor's Hauler and Disposal Site shall be approved by the Owner.

B. The Contractor shall give twenty-four (24) hour notification prior to removing any waste from the site. Waste shall be removed from the site only during normal working hours unless otherwise specified by the Owner. No waste may be taken from the site unless the Contractor and Environmental Consultant are present, and the Environmental Consultant authorizes the release of the waste as described herein.

C. All waste generated as part of the asbestos project shall be removed from the site within ten (10) calendar days after successful completion of all asbestos abatement work.

D. Upon arrival at the Project Site, the Hauler must possess and present to the Environmental Consultant a valid Asbestos Hauler's Permit. The Environmental Consultant may verify the authenticity of the hauler's permit with the proper authority.

E. The Hauler, with the Contractor and the Environmental Consultant, shall inspect all material in the transport container prior to taking possession and signing the Asbestos Waste Manifests.

F. Unless specifically approved by the Owner, the Contractor shall not permit any off-site transfers of the waste or allow the waste to be transported or combined with any other off-site asbestos material. The Hauler must travel directly to the disposal site as identified on the notifications with no unauthorized stops.

4.02 WASTE STORAGE CONTAINERS

A. All waste containers shall be fully enclosed and lockable (i.e. enclosed dumpster, trailer, etc.). No open containers will be permitted on-site (i.e. open dumpster with canvas cover, etc.) unless specifically permitted by a Variance. When asbestos contaminated waste must be kept on the work site overnight or longer, it shall be double bagged and stored in accordance with Federal, State, and local laws.

B. The container shall be plasticized and sealed with two (2) layers of 6 mil polyethylene. Once on site, it shall be kept locked at all times, except during load out. The waste container shall not be used for storage of equipment or contractor supplies.

C. While on-site, the container shall be labeled with EPA Danger signage:

DANGER
CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG DISEASE HAZARD

D. The Asbestos Hauler shall comply with DOT, Cal-Trans, and DTSC requirements in connection with hauling asbestos waste.

E. The container is not permitted to be loaded unless it is properly plasticized with two layer of 6-mil poly sheeting, has the appropriate danger signage affixed, and waste containers have appropriate waste labels.

F. Before an enclosed container is removed from the Project Site for transportation to the Disposal Site, a seal will be placed on the door(s) of the container by the Contractor and then verified by the Environmental Consultant. The door(s) shall also be locked. The seals and locks shall be removed at the Disposal Site by the operator of the Disposal Facility and the seals shall be returned by the Disposal Facility to the Contractor.

G. Open top containers will not be permitted for asbestos waste on this project.

H. The Owner may initiate random checks at the Disposal Site to ensure that the procedures outlined herein are complied with.

4.03 OWNER'S AND HAULER'S ASBESTOS WASTE MANIFESTS

A. An appropriate asbestos waste manifest shall be prepared by the Contractor and reviewed by the Environmental Consultant and/or the Owner's appointed representative.

B. The Manifests shall have the appropriate signatures of the Environmental Consultant, the Contractor, and the Hauler representatives prior to any waste being removed from the site.

C. Copies of the completed Owner's Manifest and the Hauler's Manifest shall be retained by the Environmental Consultant and the Contractor and shall remain on site for inspection.

D. Upon arrival at the Disposal Site, the Owner's Manifest and the Hauler's Manifest shall be signed by the Disposal Facility operator to certify receipt of ACM covered by the manifest.

E. The Disposal Facility operator shall return the original Owner's Manifest and the Hauler's Manifest and the container seals to the Contractor.

F. The Contractor shall forward copies of the Owner's Manifest and the Hauler's Manifest and the container seals to the Environmental Consultant within 14 days of the waste container being removed from the site. Failure to do so may result in payment being withheld from the Contractor.

G. The Contractor shall maintain copies on site of all Waste shipment manifests and provide copies to the Environmental Consultant at the time of waste pick up at the site.

H. Originals of all waste disposal manifests shall be submitted by the Contractor to the Owner with the final close-out documentation.

END OF SECTION 02 08 00 02 08 00

This page intentionally left blank

SECTION 02 09 00
LEAD PAINT HAZARD MITIGATION

PART 1 - GENERAL

1.01 SCOPE

A. Work under this specification section shall include the special handling measures and work practices required for renovation and demolition (construction) activities impacting various materials containing or covered by lead paint (or lead coatings), including the loading, transportation and final off-site disposal of non-hazardous and/or hazardous lead construction and demolition waste, the recycling of metallic components covered with lead paint, and the subsequent cleaning of the affected environment.

B. The primary and general intent of this specification is to reduce lead-based paint (LBP) exposure to workers, lead hazards, lead contamination of the environment and proper disposal of lead containing waste during specific construction work efforts indicated in the Contract Documents.

C. For the purposes of this Project, Lead-based paint (LBP) is any paint or coating found to contain 1.0 mg/cm2 of lead when analyzed by XRF or 0.5% (5000 parts per million) of lead when a paint chip sample is analyzed by flame atomic absorption spectrometry (AAS). “Lead containing paint” (LCP) includes paint found to contain 0.7 mg/cm2 of lead or greater by X-Ray Fluorescence (XRF) testing.

D. For the purposes of this Project, a lead “hazardous waste” debris or material is any waste stream in which lead is present in concentrations at or greater than 1,000 parts per million (ppm, or sometimes reported in its equivalent, milligrams per kilogram) when analyzed for Total Threshold Lead Concentration (TTLC) or in concentrations at or greater than 5.0 milligrams per liter (mg/L) when analyzed by Toxicity Characteristic Leaching Procedure (TCLP) or in concentrations at or greater than 5.0 mg/L when analyzed by Soluble Threshold Limit Concentration (STLC) “California Wet Extraction Test (WET) by qualified and accredited laboratories.

E. All activities shall be performed in accordance with, but not limited to, the current revision of the OSHA Lead in Construction Regulations (29 CFR 1926.62), the USEPA RCRA Hazardous Waste Regulations (40 CFR Parts 260 through 274), the California Department of Public Health (CDPH) Title 17, California Department of Toxic Substances Control (DTSC) Title 22, the USDOT Hazardous Materials Regulations (49 CFR Parts 171 through 180) and the EPA Lead Safe Renovation, Repair and Painting (RRP) Regulations (40 CFR 745.80 Subpart E) and Department of Housing and Urban Development (HUD) Title X.

F. Activities shall be performed by individuals with appropriate levels of OSHA lead awareness and hazard communication training, CDPH Lead Construction Workers, and shall be supervised by the Contractor’s Competent Person who is also a licensed CDPH Lead Supervisor on the job site at all times. The Contractors Competent Person is one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them. The supervisor shall possess a current CDPH license as a Lead Supervisor.

G. Hazardous lead waste debris (as defined in 1.01, paragraph C above) shall be transported from the Project by a licensed hazardous waste transporter and disposed of at an EPA permitted hazardous waste facility within 90 days from the date of generation. Other State specific licenses and permits may also apply.

H. Deviations from these Specifications require the written approval of the Architect/Owner.

1.02 DESCRIPTION OF WORK

A. All work impacting the lead painted materials identified below shall be conducted in accordance with the OSHA Lead in Construction Standard, 29 CFR 1926.62 and Cal-OSHA CCR Title 8, Section 1532.1, and within an established Regulated Area with a worker wash

facility/decontamination system. The Contractor shall utilize and implement appropriate engineering controls and work practices to prevent the spread of lead dust and debris beyond the Regulated Area and limit the generation of airborne lead dust. All wastes containing lead paint shall be properly contained and secured for storage, transportation and disposal.

B. Data for random lead testing conducted on surfaces throughout the buildings and if available, any lead waste characterization results are provided in Appendix A. This information is for informational purposes only. Under no circumstances shall this information be the sole means used by the Contractor for determining the extent of lead painted materials. The Contractor shall be responsible for verification of all field conditions affecting performance of the work as described in these Specifications in accordance with OSHA, USEPA, USDOT, DTSC and CDPH standards. Compliance with the applicable requirements is solely the responsibility of the Contractor.

C. The Contractor shall conduct exposure assessments for all tasks which impact lead paint in accordance with OSHA 29 CFR 1926.62(d) and shall implement appropriate personal protective equipment until negative exposure assessments are developed.

D. Contractor shall use only Certified Lead Workers and Supervisors for all aspects of work affecting lead-based paint. The Contractor shall abide by the requirements of Title 17, Division 1 Chapter 8 and Title 8, CCR Section 1532.1.

E. In the event of poor work practices that allow the passage of lead dust or debris to areas outside the Work Area, and baseline levels to be exceeded, the Contractor shall institute corrective actions at no additional cost to Owner.

F. Following the completion of the interior and /or exterior lead-related work, such as stabilization of lead paint and the protective floor coverings (drop cloths) have been removed the contractor is required to visually inspect the interior Work Area such as the building perimeter and pick up any visible LBP chips which may have fallen between the drop cloth seal and the exterior wall of the building. Following the visible paint debris clean-up and the visual inspection by the owner’s representative, a certificate of visual inspection for that building will be issued. Lead clearances for interior work may be issued following lead clearance sampling of interior floor or window components prior to the issuance of the clearance certification by the owner’s representative.

G. Lead hazard reduction efforts must be followed by area clean-up and decontamination. Work Areas shall not be released until lead dust levels are below the clearance standards or the lead-contaminated dust level definition set forth in Title 17, Division 1 Chapter 8 Section 35035. The Contractor shall perform all repeated cleaning processes needed to meet the clearance criteria at no additional cost to the Owner.

H. LBP waste shall be profiled/characterized by the Contractor prior to disposal. Characterization samples shall be analyzed at an accredited laboratory to determine final disposition, and properly packaged for disposal by the Contractor according to applicable federal and State regulations.

I. The following describes work in which LBP may be affected by planned renovation work for this project, based on the conceptual design information available at the time of preparing this specification section. Phase areas may be combined or divided at the direction of the Architect/Construction Manager. Proceed through the sequencing of the work phases under the direction of the Architect/Construction Manager.

DAMAGED LBP THAT REQUIRES STABILIZATION PRIOR TO RENOVATION OR DEMOLITION

The paint film stabilization shall include the removal of damaged paint, decontamination of the surfaces, and the application of an approved primer over the removed paint surfaces as a final measure to lockdown residual LBP dust. For surface preparation/paint film stabilization purposes, damaged paint characteristics shall include but not limited to paint that is peeling, chalking, blistering, checking, flaking, alligatoring and scaling.

NON-METALLIC COMPONENTS TO BE IMPACTED - OSHA

LBP has been identified on various non-metallic components throughout the facility including interior sheetrock and plaster walls, interior cinder block walls, interior brick walls, interior wood door/window components, interior metal door/window components, interior wood baseboards, exterior wood door/window components. All work impacting those materials shall be conducted within an established lead control (regulated) area with a remote hand wash facility/decontamination system in accordance with OSHA Lead in Construction Standards. In accordance with OSHA 29 CFR 1926.62, engineering controls and work practices shall be utilized to prevent the spread of lead dust and debris beyond the Regulated Area and limit the generation of airborne lead. All wastes containing lead paint shall be properly contained and secured for storage, transportation and disposal.

METAL COMPONENTS TO BE IMPACTED - OSHA

LBP has been identified on various metal interior and exterior components throughout the facility including interior and exterior door/window components. Work impacting those materials shall be conducted within an established lead control (regulated) area with a remote worker wash facility/decontamination system in accordance with OSHA Lead in Construction Standards. In accordance with OSHA 29 CFR 1926.62, engineering controls and work practices shall be utilized to prevent the spread of lead dust and debris beyond the Regulated area and limit the generation of airborne lead. Steel and metal waste generated from the work shall be segregated and recycled as scrap metal at an approved scrap metal recycling facility. The recycling of scrap metal (regardless of LBP concentration) is exempt from USEPA RCRA and DTSC Hazardous Waste Regulation.

The lead abatement contractor shall be responsible to sample, test and submit for laboratory analysis waste stream samples associated with LBP waste described herein. Results of testing shall be submitted to the Architect Owner’s representative and prior to waste packaging and labeling prior to removal of waste from the Site.

SURFACE PREPARATION - OSHA

Surface preparation techniques such as sanding, sandblasting, scraping, etc. which are utilized on surfaces coated with lead paints/coatings must be conducted in accordance with the OSHA worker protection and USEPA RCRA/DTSC waste disposal standards. All work impacting those materials shall be conducted within an established lead control (regulated) area with a worker wash facility/decontamination system in accordance with OSHA Lead in Construction Standards. In accordance with OSHA 29 CFR 1926.62, engineering controls and work practices shall be utilized to prevent the spread of lead dust and debris beyond the Regulated Area and limit the generation of airborne lead. All wastes containing lead paint shall be properly contained and secured for storage, transportation and disposal.

1.03 SUBMITTALS AND NOTICES

A. Prior to the start of any work that will generate hazardous lead waste above conditionally exempt small quantities (greater than 100 kg/month or greater than 1000 kg at any time), the Contractor shall obtain from the Owner or Owner’s representative a temporary EPA Hazardous Waste Generators ID, unless otherwise directed by the Architect.

B. Prior to the generation of any hazardous waste, provide a copy of the USEPA permit for disposal of hazardous lead bearing waste for each proposed hazardous waste treatment storage disposal facility. Also provide a copy of each proposed hazardous waste transporters current USDOT Certificate of Registration and current Hazardous Waste Transporter permits (as required) for the State of California, the hazardous waste destination state and any other applicable states.

C. Fifteen (15) working days prior to beginning work that impacts lead paint, the Contractor shall submit the following to the Architect:
   1. Work plan for work impacting lead paint including engineering controls, personal protective equipment (PPE), methods of containment of debris and work practices to be employed, as needed, to minimize employee exposure and prevent the spread of lead

contamination outside the Regulated Area.

2. For projects when the intent is to mitigate lead hazards and provide lead-safe conditions for building occupants, a valid CDPH Lead Abatement Contractor License and copies of employee certifications/licenses as CDPH Lead Abatement Supervisors and Workers.
3. Copies of all employee certificates, dated within the previous twelve (12) months, relating to OSHA lead awareness and hazard communication training, USEPA RRP training and training in the use of lead-safe work practices. SSPC, HUD LSWP and USEPA RRP training programs may be deemed acceptable as meeting these requirements if it can be demonstrated that such training addressed all required OSHA topics.
4. Name and qualifications of Contractor's OSHA Competent Person under 29 CFR 1926.62.
5. Copies of the Certification from the USEPA that the Contractor is a Certified Lead Renovator under EPA RRP 40 CFR 745.89.
6. Copies of Certification(s) from the USEPA for the individual(s) who will direct the renovations covered under EPA RRP, indicating they are individually Certified Lead Renovators and copies of RRP training for all individuals who will perform renovation covered under EPA RRP, as required under EPA 40 CFR 745.89-90.
7. Documentation from the Contractor, typed on company letterhead and signed by the Contractor, certifying that all employees listed therein have received the following:
   a. medical monitoring within the previous twelve (12) months, as required in 29 CFR 1926.62;
   b. biological monitoring within the previous six (6) months, as required in 29 CFR 1926.62;
   c. respirator fit testing within the previous twelve (12) months, as required in 29 CFR 1910.134 (for those who don a tight-fitting face piece respirator)
8. Name of proposed waste recycling facility for lead-painted asphalt, brick, stone, and concrete that meets California Remediation Standard Regulations (RSR) and/or DTSC Remediation Performance Guidelines (RPGs) for school sites criteria. If these materials do not meet DTSC/School Site Criteria, they will be disposed of as a non-hazardous construction and demolition (C&D) waste.
9. Names of the proposed non-hazardous construction and demolition (C&D) lead debris bulky waste disposal facility (DTSC-permitted Solid Waste landfill)
10. Names of the proposed scrap metal recycling facilities. The Contractor shall submit to the Architect all documentation necessary to demonstrate the selected facility is able to accept lead-painted scrap metal.
11. Negative exposure assessments conducted within the previous 12 months documenting that employee exposure to lead for each task is below the OSHA Action Level of 30 µg/m3. If a negative exposure assessment has not been conducted, the Contractor shall submit its air monitoring program for the work tasks.

D. No activity shall commence until all required submittals have been received and found acceptable to the Architect/Owner. Those employees added to the Contractor's original list will be allowed to perform work only upon submittal of acceptable documentation to, and review by, the Architect/Owner.

E. Provide the Architect/Owner, within thirty (30) days of completion of the project site work, a compliance package; which shall include, but not be limited to, the following:
   1. Competent persons (supervisor) job log;
   2. OSHA-compliant personnel air sampling data and exposure assessments;
   3. Completed waste shipment papers for non-hazardous lead construction and demolition (C&D) bulky waste disposal and scrap metal recycling.
   4. Completed certified hazardous waste manifests for hazardous lead debris.
   5. Documentation certifying compliance with EPA RRP work practices using EPA's Renovation Recordkeeping Checklist form (for those areas covered under EPA RRP), as required under 40 CFR 745.86.

PART 2 - PRODUCTS

2.01 MATERIALS

A. All materials shall be delivered to the job site in the original packages, containers, or bundles bearing the name of the manufacturer, the brand name and product technical description, with MSDS sheets as applicable.

B. No damaged or deteriorating materials shall be used. If material becomes contaminated with lead, the material shall be decontaminated or disposed of as lead-containing waste material. The cost to decontaminate and dispose of this material shall be at the expense of the Contractor.

C. Fire retardant polyethylene sheet shall be in roll size to minimize the frequency of joints, with factory label indicating no less than six (6) mil thickness.

D. Polyethylene disposable bags shall be no less than six (6) mils thick.

E. A commercial grade duct tape (or equivalent) capable of sealing joints in adjacent polyethylene sheets and for the attachment of polyethylene sheets to finished or unfinished surfaces must be capable of adhering under both dry and wet conditions.

F. Cleaning agents and detergent shall be lead specific, such as Tri-Sodium Phosphate (TSP).

G. Any chemical strippers and chemical neutralizers to be utilized shall be compatible with the substrate as well as with each other. Such chemical strippers shall contain less than 50% volatile organic compounds (VOCs) in accordance with RCSA 22a-174-40 Table 40-1.

H. Labels and warning signs shall conform to OSHA 29 CFR 1926.62, USEPA 40 CFR 745, USEPA 40 CFR 260 through 274 and USDOT 49 CFR 172 as appropriate.

I. Any planking, bracing, shoring, barricades and/or temporary sheet piling, necessary to appropriately perform work activities shall conform to all applicable federal, state and local regulations.

J. Air filtration devices and vacuum units shall be equipped with HEPA filters with a minimum efficiency of filtering 99.97% of particles with a diameter size of 3 microns or larger.

2.02 TOOLS AND EQUIPMENT

A. The Contractor shall provide tools and equipment that are suitable for lead paint related activity:
   1. Air monitoring equipment of the type and quantity required to monitor operations and conduct personnel exposure surveillance in accordance with OSHA requirements.
   2. Electrical equipment, protective devices and power cables shall conform to all applicable codes.
   3. In the absence of a negative exposure assessment or where lead exposures are above the OSHA Action Level or PEL, the Contractor shall provide wash facilities/shower stalls and plumbing that include sufficient hose length and drain system or an acceptable alternate. One shower stall shall be provided for each eight workers. A separate shower and change room shall be constructed for female workers.
   4. In the absence of a negative exposure assessment or where lead exposures are above the OSHA PEL, the Contractor shall provide exhaust air filtration units that are equipped with HEPA filters to provide local exhaust ventilation at the Work Area to reduce airborne lead emissions.
   5. The Contractor shall provide vacuum units of suitable size and capabilities for the project which have HEPA filters capable of trapping and retaining at least 99.97 percent of all monodispersed particles of three micrometers in diameter or larger. HEPA vacuums shall also be equipped with a beater bar.
   6. The Contractor shall provide ladders and/or scaffolds of adequate length, strength and sufficient quantity to support the work schedule. Scaffolds shall be equipped with safety rails and kick boards in compliance with OSHA requirements.
   7. Protective clothing, respirators and HEPA P100 filter cartridges shall be provided by the Contractor in sufficient quantities for the project. Disposable coveralls shall be Tyvek® or

approved equivalent. Disposable coveralls shall be on-piece, attached head and foot/boot covers.

8. The contractor shall furnish protective boots for adequate foot protection and safety glasses/face shields.
9. Equipment suitable for building renovation/demolition and proper waste/debris collection/packing/removal, (e.g. excavators, grapples, backhoes, roll-offs, etc.) shall be provided by the Contractor as required.

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

A. All employees of the Contractor who perform work impacting lead paint shall be properly trained to perform such duties. In addition, the Contractor shall instruct all workers in all aspects of personnel protection, work procedures, emergency evacuation procedures and use of equipment including procedures unique to this project.

B. Contractor shall provide all labor, materials, tools, equipment, services, testing, insurance (with specific coverage for work on lead), and incidentals which are necessary or required to perform the work in accordance with applicable governmental regulations, industry standards and codes, and these Specifications.

C. Prior to beginning work, the Owner's representative (Environmental Consultant, if needed) and Contractor shall perform a visual survey of each Work Area and review conditions at the site.

D. As necessary, the Contractor shall:
   1. Shutdown and isolate heating, cooling, and ventilating air systems to prevent contamination and particulate dispersal to the other areas of the building.
   2. Shut down and lock out electrical power, including all receptacles and light fixtures, when feasible. The use or isolation of electrical power will be coordinated with all other ongoing uses of electrical power at the site.
   3. Coordinate all power and fire alarm isolation with the appropriate representatives.
   4. When necessary, provide temporary power and adequate lighting and ensure safe installation of electrical equipment, including ground fault protection and power cables, in compliance with applicable electrical codes and OSHA requirements. The Contractor is responsible for proper connection and installation of electrical wiring.

E. Ladders and/or scaffolds to be utilized throughout this project shall be in compliance with OSHA requirements, and of adequate length, strength and sufficient quantity to support the scope of work. Use of ladders/scaffolds shall be in conformance with OSHA 29 CFR 1926 Subpart L and X requirements.

F. Work performed at heights exceeding six feet (6') shall be performed in accordance with the OSHA Fall Protection Standard 29 CFR 1926 Subpart M including the use of fall arrest systems as applicable.

G. If adequate electrical supply is not available at the site, the Contractor shall supply temporary power. Such temporary power shall be sufficient to provide adequate lighting and power the Contractor's equipment. The Contractor is responsible for proper connection and installation of electrical wiring and shall ensure safe installation of electrical equipment in compliance with applicable electrical codes and OSHA requirements.

H. If water service is not available at the site for Contractor's use, the Contractor shall supply sufficient water for each shift to operate the wash facility/decontamination shower units in addition to the water needed at the Work Area.

I. The Owner may provide a Project Monitor to monitor compliance of the Contractor. In such cases no activity impacting lead paint shall be performed until the Project Monitor is on-site. Environmental sampling, including ambient air sampling, TCLP waste stream sampling and/or dust wipe sampling, will be conducted by the Environmental Consultant/Project Monitor as deemed necessary throughout the project. Air monitoring to comply with the Contractor's obligations under OSHA remains solely the responsibility of the Contractor.

J. If air samples collected outside of the Regulated Area during activities impacting lead paint indicate airborne lead concentrations greater than original background levels or 30 ug/m3, whichever is larger, or if at any time visible emissions of lead paint extend out from the Regulated Area, an examination of the Regulated Area shall be conducted and the cause of such emissions corrected. Cleanup of surfaces outside the Regulated Area using HEPA vacuum equipment or wet cleaning techniques shall be done prior to resuming work.

K. Work outside the initial designated area(s) will not be paid for by the Owner. The Contractor will be responsible for all costs incurred from these activities including repair of any damage.

3.02 ESTABLISHMENT OF REGULATED WORK AREAS

A. The Contractor shall establish a Regulated Area, through the use of appropriate barrier tape, or other means to control unauthorized access into the area when activities impacting lead paint are occurring.

B. Warning signs meeting the requirements of OSHA 29 CFR 1926.62 shall be posted at all approaches to Regulated Areas. These signs shall read:

WARNING
LEAD WORK AREA
POISON
NO SMOKING OR EATING
AUTHORIZED PERSONNEL ONLY

C. The Contractor shall implement appropriate engineering controls such as critical barriers, poly drop cloths, negative pressure, local exhaust ventilation, wet dust suppression methods, etc., as necessary, to prevent the spread of lead contamination beyond the Regulated Area in accordance with the Contractor's approved work plan. Should the previously submitted work plan prove to be insufficient to contain suspected lead dust and debris, the Contractor shall modify its plan and submit it for review by the Architect and/or Environmental Consultant.

D. For exterior Work Areas, the Contractor shall use a High Efficiency Particulate Air (HEPA) filtered vacuum dust collection system to remove any visible existing paint chips from the ground to a distance of 20' out from the base of the exterior surface scheduled for lead paint activity prior to commencement of work and extend a 6 mil polyethylene sheet drop cloth on the ground adjacent to the exterior surface scheduled for lead paint activity to contain debris/contamination.

E. In addition to the requirements above, in any child-occupied facility areas, where renovations will impact lead based paint > 1.0 mg/cm2 the Contractor shall also follow all provisions of the USEPA RRP regulations with respect to proper work practices in accordance with EPA 40 CFR 745.85, including, but not limited to: posting warning signs at Work Areas, proper containment of the Work Areas so that no dust or debris leaves the Work Areas, and proper use of engineering controls including regulated areas, critical barriers, drop cloths, etc.

F. Specifically for interior renovations subject to RRP, Contractor shall: remove all objects from the Work Areas or cover them with poly sheeting with all seams and edges taped or otherwise sealed; close and seal all duct openings in the Work Areas with poly critical barriers; close windows and doors in the Work Areas with doors sealed with a poly critical barrier; cover the floor surface with a sealed down poly sheet in the Work Area and a minimum of six feet beyond the perimeter of surfaces undergoing renovation.

G. Specifically for exterior renovations subject to RRP, Contractor shall: close all doors and windows within 20 feet of the renovation; seal all doors leading into the renovation area with poly critical barriers; cover the ground with poly sheet in the Work Area extending a minimum of 10 feet beyond the perimeter of surfaces undergoing renovation; as necessary erect vertical containment to prevent migration of dust and debris outside of the regulated area or onto adjacent property.

3.03 WASH FACILITIES

A. The Contractor shall provide hand wash facilities in compliance with 29 CFR 1926.51(f) and 29 CFR 1926.62 regardless of airborne lead exposure.

B. If employee exposure to airborne lead exceeds the OSHA Permissible Exposure Limit (PEL) of 50 micrograms per cubic meter of air (µg/m3), shower rooms must be provided. The Shower Room shall be of sufficient capacity to accommodate the number of workers. One shower stall shall be provided for each eight (8) workers. Showers shall be equipped with hot and cold or warm running water. Shower water shall be collected and filtered using best available technology and disposed of in accordance with all federal, state and local laws, regulations and ordinances.

3.04 PERSONNEL PROTECTION

A. Exposure Assessments: The Contractor shall initially determine if any employee performing construction tasks impacting lead paint may be exposed to lead at or above the OSHA Action Level of 30 micrograms per cubic meter (30 µg/m3). Assessments shall be based on initial air monitoring results as well as other relevant information. The Contractor may rely on historical air monitoring data obtained within the past 12 months under workplace conditions closely resembling the process, type of material, control methods, work practices and environmental conditions used and prevailing in the Contractors current operations to satisfy the exposure assessment requirements. Monitoring shall continue as specified in the OSHA standard until a negative exposure assessment is developed.

B. Until a negative exposure assessment is developed for each task impacting lead paint, the Contractor shall ensure that all workers and authorized persons entering the Regulated Area wear protective clothing and respirators in accordance with OSHA 29 CFR 1926.62. Protective clothing shall include impervious coveralls with elastic wrists and ankles, head covering, gloves and foot coverings. Sufficient quantities shall be provided to last throughout the duration of the project.

C. Protective clothing provided by the Contractor and used during chemical removal operations shall be impervious to caustic materials. Gloves provided by the Contractor and used during chemical removal shall be of neoprene composition with glove extenders.

D. Respiratory protective equipment shall be provided and selection shall conform to 42 CFR Part 84, 29 CFR Part 1910.134, and 29 CFR Part 1926.62. A formal respiratory protection program must be implemented in accordance with 29 CFR Part 1926.62 and 29 CFR Part 1910.134.

3.05 AIR MONITORING REQUIREMENTS

A. The Contractor shall:

1. Provide air monitoring equipment including sample filter cassettes of the type and quantity required to properly monitor operations and personnel exposure surveillance throughout the duration of the project.
2. Conduct initial exposure monitoring to determine if any employee performing construction tasks impacting lead paint may be exposed to lead at or above the OSHA Action Level of 30 ug/m3. Monitoring shall continue as specified in the OSHA standard until a negative exposure assessment is developed.
3. Conduct personnel exposure assessment air sampling (8-hour TWA), as necessary, to assure that workers are using appropriate respiratory protection in accordance with OSHA Standard 1926.62. Documentation of air sampling results must be recorded at the work site within twenty-four (24) hours and shall be available for review until the job is complete.

3.06 LEAD PAINT ACTIVITY PROCEDURES

A. The Contractor’s Competent Person shall be at the job at all times during work impacting lead, as well as the Contractors Certified RRP Renovator when work is conducted in areas subject to EPA RRP.

B. Work impacting lead paint shall not begin abatement work until authorized by the owner’s representative, following a pre-abatement visual inspection.

C. Any activity impacting lead painted surfaces shall be performed in a manner which minimizes the spread of lead dust contamination and generation of airborne lead.

D. The Contractor shall ensure proper entry and exit procedures for workers and authorized persons who enter and leave the Regulated Area. All workers and authorized persons shall leave the Regulated Area and proceed directly to the wash or shower facilities where they will HEPA vacuum gross debris from work suit, remove and dispose of work suit, wash and dry face and hands, and vacuum clothes. Do not remove lead chips or dust by blowing or shaking of clothing. Wash water shall be collected, filtered and disposed of in accordance with federal, state and local water discharge standards. Any permit required for such discharge shall be the responsibility of the Contractor.

E. No one shall eat, drink, smoke, chew gum or tobacco or apply cosmetics while in the Regulated Area.

F. Utilize appropriate engineering controls and work practices (e.g. wet methods) as directed by 29 CFR 1926.62 (and 40 CFR 745.85 as applicable) to control lead emissions and contamination.

G. Properly contain wastes containing lead paint for appropriate storage, transport and disposal.

H. Stop all work in the regulated area and take steps to decontaminate non-Work Areas and eliminate causes of such contamination should lead contamination be discovered in areas outside of the regulated area.

I. Special Requirements:
   1. Demolition/Renovation:
      a. Demolish/renovate in a manner which minimizes the spread of lead contamination and generation of lead dust.
      b. Implement dust suppression controls, such as misters, local exhausts ventilation, etc. to minimize the generation of airborne lead dust.
      c. Segregate Work Areas from non-Work Areas through the use or barrier tape, poly critical barriers, etc.
      d. Clean up immediately after renovation/demolition has been completed.
   2. Chemical Removal:
      a. Apply chemical stripper in quantities and for durations specified by manufacturer.
      b. Where necessary scrape lead paint from surface down to required level of removal (i.e. stabilized surface, bare substrate with no trace of residual pigment, etc.). Use sanding, hand scraping, and dental picks to supplement chemical methods as necessary.
      c. Apply neutralizer compatible with substrate and chemical agent to substrate following removal in accordance with manufacturer's instructions.
      d. Protect adjacent surfaces from damage from chemical removal.
      e. Maintain a portable eyewash station in the Work Area.
      f. Wear respirators that will protect workers from chemical vapors.
      g. Do not apply caustic agents to aluminum surfaces.
   3. Paint Stabilization/Liquid Encapsulation:
      a. Remove surface dust, dirt, mildew, scale, rust or other debris by scrubbing with detergent (lead-specific detergent solution) and rinsing. Remove loose paint using wet scraping methods until a sound surface is achieved. Remove unsound substrate not firmly adhered and repair with an appropriate patching material.
      b. Remove and reinstall or protect electrical receptacles, hardware and wall mounted objects from being painted-over by encapsulant. Protect adjacent finishes from paint splatter or other damage.
      c. Apply encapsulant in a continuous coat. Number of coats is as specified in the manufacturer’s instructions for application. Encapsulant shall meet regulatory requirements for concerns involving air emissions and waste disposal. Use encapsulants only on substrates and locations approved for use in the manufacturers’

instructions.

d. Prior to application of encapsulants, perform the tape, X-cut tape and patch tests in accordance with industry standard guidance document information on Applying Liquid Encapsulants to Interior Surfaces for Property Owners and Lead Professionals to determine if the surface is suitable for encapsulation.

4. Mechanical Paint Removal:
   a. Provide sanders, grinders, rotary wire brushes, or needle gun removers equipped with a local HEPA filtered vacuum dust collection system. Cowling on the dust collection system for orbital-type tools must be capable of maintaining a continuous tight seal with the surface being abated. Cowling on the dust collection system for reciprocating-type tools shall promote an effective vacuum flow of loosened dust and debris. Inflexible cowlings may be used on flat surfaces only. Flexible contoured cowlings are required for curved or irregular surfaces.
   b. Provide HEPA vacuums that are high performance designed to provide maximum static lift and maximum vacuum system flow at the actual operating vacuum condition with the shroud in use. The HEPA vacuum shall be equipped with a pivoting vacuum head.
   c. Remove lead paint from surface down to required level of removal (i.e. stabilized surface, bare substrate with no trace of residual pigment, etc.). Use chemical methods, hand scraping, and dental picks to supplement abrasive removal methods as necessary.
   d. Protect adjacent surfaces from damage from abrasive removal techniques.
   e. “Sandblasting” type removal techniques should be performed within full containment negative pressure enclosures.
5. Component Removal/Replacement:
   a. Wet down components which are to be removed to reduce the amount of dust generated during the removal process.
   b. Remove components utilizing hand tools and follow appropriate safety procedures during removal. Remove the building components by approved methods which will provide the least disturbance to the substrate material. Do not damage adjacent surfaces.
   c. Clean up immediately after component removals have been completed. Remove any dust located behind the component removed.
6. Interior/Exterior Lead Hazard Reduction Work – Decontamination
   a. First cleaning: Conduct a first cleaning of all surfaces affected by the work including remaining sheeting, ladders, scaffolding and exterior of building extending ten (10) feet radius from the work by use of a HEPA vacuuming followed by wet cleaning if applicable. Immediately following first cleaning, remove and dispose of plastic sheeting. Remove any remaining paint chips on soil or surrounding walkways, porches, etc.
   b. Final cleaning: Conduct a final cleaning of all surfaces in the same manner as the first cleaning. Comply with the requirements of visual inspection or clearance sampling in interior Work Areas.

3.07 PROHIBITED REMOVAL METHODS

A. Due to the inherent fire dangers and the availability of commercial chemical stripping products, use of heat guns will not be allowed for this project for the purposes of lead abatement, stabilization or other de-leading operations. Special exceptions may be granted where the contractor has adequately demonstrated through field pilot tests that all other methods other than heat gun use are not feasible or effective.

B. The use of sand, steel grit, water, air, CO2, baking soda or any other blasting media to remove lead or lead paint without the use of a HEPA ventilated contained negative pressure enclosure is prohibited.

C. Power tool assisted grinding, sanding, cutting, needle gun, power planning or wire brushing of lead paint without the use of cowled HEPA vacuum dust collection systems is prohibited.

D. Lead paint burning, busting of lead rivets, welding of materials painted with lead paint and torch cutting of materials painted with lead paint is prohibited. Where cutting, welding, busting or torch cutting of materials is required, pre-remove the lead paint in the area that is being impacted six (6) inches on either side.

E. Use of chemical strippers containing Methylene Chloride is prohibited.

F. Compressed air shall not be utilized to remove lead paint.

G. Power/Pressure washing shall not be used to remove paint.

3.08 CLEAN-UP AND VISUAL INSPECTION/VERIFICATION

A. The Contractor shall remove and containerize all lead waste material and visible accumulations of debris, paint chips and associated items.

B. During clean up the Contractor shall utilize rags and sponges wetted with lead-specific detergent and water as well as HEPA filtered vacuum equipment. Dry sweeping is not permitted

C. The Environmental Consultant will conduct a visual inspection of the Work Areas in order to document that all surfaces have been maintained as free as practicable of accumulations of lead in accordance with OSHA 29 CFR 1926.62(h). If visible accumulations of waste, debris, lead paint chips or dust are found in the Work Area, the Contractor shall repeat the cleaning, at the Contractor's expense, until the area is in compliance. The visual inspection will detect incomplete work, damage caused by the abatement activity, and inadequate clean-up of the work site.

D. Dust wipe clearance testing, in accordance with CDPH/USEPA/HUD protocols, will also be performed by the Environmental Consultant if so detailed in Section 1.2. Description of Work. If lead dust wipe levels are above CDPH/EPA/HUD clearance criteria, the Contractor shall re-clean the Work Area and retesting shall be conducted at the Contractors expense. The testing and cleaning sequence shall be repeated until the clearance criteria levels have been achieved.

E. In addition to the requirements above, in any child-occupied facility areas, where renovations will impact lead based paint > 1.0 mg/cm2 the Contractor shall also follow all provisions of the USEPA RRP regulations with respect to proper cleaning practices in accordance with EPA 40 CFR 745.85, including, but not limited to: misting the floor sheeting before folding it dirty side inward and either taping it shut to seal or sealing in heavy duty poly disposal bags; leaving poly sheeting/critical barriers used to isolate the Work Area from non-Work Areas in place until after the cleaning is complete.

F. For interior renovations subject to RRP, Contractor shall: clean all objects and surfaces in the Work Area and within 2 feet of the Work Area, cleaning from higher to lower, including walls and all remaining surfaces and objects in the Work Areas via damp wiping and HEPA vacuuming. HEPA vacuums must be equipped with a beater bar. Uncarpeted floors shall then be mopped using a method that keeps the wash water separate from the rinse water.

G. In interior child-occupied facility spaces and associated common areas subject to EPA RRP, the Contractor shall perform final cleaning verification testing according to USEPA RRP Regulations (40 CFR 745.85), including: inspection/testing conducted by the Certified Renovator; visual inspection of the Work Area to ensure all dust, debris and residue is removed; verification that each window sill and every 40 square feet of uncarpeted floor and countertop within the Work Areas have been adequately cleaned using disposable cleaning cloth (DCC) wipes and the USEPA RRP Cleaning Verification Card procedures described in 40 CFR 745.85. A DCC is means a commercially available dry, electrostatically charged, white disposable cloth designed to be used for cleaning hard surfaces such as uncarpeted floors. For exterior Work Areas subject to RRP the Certified Renovator shall conduct a visual inspection of the Work Area to ensure all dust, debris and residue is removed.

H. When Clearance Inspection is required, Contractor shall request Owner’s Representative to conduct the inspection. Clearance inspection shall be conducted by a CDPH Certified Lead Inspector/Assessor, a Certified Lead Project Monitor or a Certified Lead Sampling Technician in accordance with procedures described in the U.S. Department of Housing and Development

"Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing," Chapter 15: Clearance.

I. If the Clearance Inspection or dust sampling results show that the Work Area is not acceptable for clearance, the cleaning cycle shall be repeated, at no additional cost to the Owner, including the cost of dust sample collection and analysis, until sample results meeting the clearance specification requirements are obtained and Owner's Representative has provided the Contractor with a written notice of acceptance. Upon receipt of the acceptance notice, the Contractor shall remove the remaining barriers and signage to the Work Area.

3.09 POST ABATEMENT WORK AREA DEREGULATION

A. Following the visual inspection (and clearance/verification testing if appropriate and specified) any engineering controls and warning signs implemented may be removed.

B. A final visual inspection of the Work Area shall be conducted by the Competent Person and the Project Monitor to ensure that all visible accumulations of suspect materials have been removed and that no equipment or materials associated with the abatement project remain. If this final visual is acceptable, the Contractor shall reopen the Regulated Area and remove all signage.

C. The Contractor shall restore all Work Areas and auxiliary areas utilized during work to conditions equal to or better than original. Any damage caused during the performance of the work activity shall be repaired by the Contractor at no additional expense to the Engineer/Owner.

3.10 NON-HAZARDOUS WASTE DISPOSAL/RECYCLING

A. Lead-containing waste shall be disposed in accordance with applicable federal, state, county or local regulations and guidelines. It shall be the sole responsibility of the Contractor to assure compliance with laws and regulations relating to this disposal.

B. The Contractor shall determine the hazardous/non-hazardous nature of the waste through characterization/ profiling of the waste. The requirements of the Resource Conservation and Recovery Act (RCRA) as well as California solid waste plan requirements shall be adhered to by the abatement contractor.

C. Waste materials shall be segregated into separate waste streams (i.e. paint chips, personal protective equipment, plastic, etc.) and placed into labeled leak tight containers. Wastewater from the washing facilities will be captured, filtered and sampled for lead content prior to disposal into the sanitary sewer system.

D. Random characterization samples of each waste stream will be collected and analyzed by California (TTLC/STLC) and if needed, Federal (TCLP) analytical methods at an accredited laboratory to determine the final disposition of the waste. Wastes shall be disposed of in accordance with applicable federal, state, and local regulations.

E. Non-metallic building debris waste materials tested and found to be non-hazardous construction and demolition waste shall be disposed of properly at a Solid Waste landfill approved to accept such waste.

F. Metallic debris shall be segregated and recycled as scrap metal at an approved metal recycling facility. The Contractor shall submit to the Architect all documentation necessary to demonstrate the selected recycling facility is able to accept lead-painted scrap metal.

G. Concrete, brick, stone, cured asphalt, etc. coated with any amount of lead paint cannot be crushed, recycled or buried on-site to minimize waste disposal unless representatively tested and found to meet the DTSC Standards. Only DTSC defined "clean fill" can be recycled on-site or sent to a recycling facility.

3.11 HAZARDOUS LEAD WASTE DISPOSAL

A. If required to dispose of any hazardous waste, the Contractor shall utilize a certified/permitted transporter for hazardous waste in compliance with DOT 49 CFR Part 172 and USEPA 40 CFR 260-274 and a permitted hazardous waste treatment storage disposal facility (TSDF) in

compliance with USEPA 40 CFR 260-274.

B. Hazardous lead bearing waste material must be offered for transportation and transported in compliance with the Code of Federal Regulations, Title 49, Chapter 1, Part 173, Subparts A, B, C, and D and Paragraph 178.118. Transport vehicles (hopper or dump type) must be free from leaks and discharge openings must be securely closed during transportation. All storage containers (roll offs or drums) shall have a protective liner and removable lid. These containers shall not have any indentations or damage that would allow seepage of the contained material.

C. The disposal of hazardous lead bearing material must be in compliance with the requirements of and authorized by the DTSC and the USEPA (RCRA).

D. The disposal of hazardous lead bearing waste shall comply with the requirements of the Resource Conservation and Recovery Act (RCRA).

E. Unless previous waste characterizations have been completed by the Environmental Consultant, all generated waste shall be containerized and stored on-site for hazardous waste determination via TTLC, and TCLP testing (if required). TCLP testing and analysis shall be the responsibility of the Environmental Consultant.

F. The dumpsters/containers containing hazardous waste are to be kept closed and covered and locked when not in active use for the loading of materials.

G. All containers of hazardous lead bearing material shall be labeled in accordance with 29 CFR 1926.62 and EPA 40 CFR 260-270.

H. All hazardous lead-bearing waste removed from the site by the Contractor shall be containerized in lined roll-offs or barrels. Store waste materials in U.S. Department of Transportation (49 CFR 178) approved containers. Properly label and placard each container to identify the type of waste (49 CFR 172) and the date the container was filled. The disposal containers shall be labeled with a six-inch square, yellow, weatherproof, hazardous waste sticker in accordance with U.S. DOT regulations, by the Contractor.

I. The Contractor may not store containerized hazardous lead waste on the job site for in excess of 90 calendar days from the accumulation start date.

J. When required to dispose of hazardous waste, the Contractor shall utilize a certified/permitted transporter for hazardous waste in compliance with USDOT 49 CFR Part 172 and USEPA 40 CFR 260-274 and a permitted hazardous waste treatment storage disposal facility (TSDF) in compliance with USEPA 40 CFR 260-274.

K. The Contractor shall complete a Uniform Hazardous Waste Manifest, EPA Form 8700-22, and submit to the Engineer for review and generator sign-off prior to each load of hazardous waste scheduled to leave the site. Completed copies of the manifest shall be delivered by the Contractor to the Architect and/or Owner within 30 calendar days following the date the load leaves the site.

L. When all necessary procedures have been completed, then the hazardous waste shall be shipped to the hazardous waste disposal facility.

M. Any spillage of debris during disposal operation, i.e., loading, transport and unloading, shall be cleaned up in accordance with the Code of Federal Regulations, Title 40, Chapter 1, Part 265, Subparts C and D, at the Contractor's expense.

N. The Contractor is liable for any fines, costs or remediation costs incurred as a result of the failure to be in compliance with this special provision and all federal, state and local laws.

O. Final payment requisitions for the contract will not be processed until a signed copy of the manifest from the treatment or disposal facility certifying the amount of lead-containing materials delivered is returned and a copy is furnished to the Architect.

END OF SECTION 02 09 00 02 09 00

This page intentionally left blank

SECTION 02 09 10
UNIVERSAL WASTE HAZARD MITIGATION

PART 1 - GENERAL

UNIVERSAL WASTES INCLUDE COMPONENTS CONTAINING POLYCHLORINATED BIPHENYLS (PCBS), CHLOROFLUOROCARBONS (CFCS) AND MERCURY (HG).

1.01 WORK INCLUDED

Work consists of furnishing transportation, labor, materials, permits, equipment, services, and insurance including but not limited to coverage for the transportation and disposal of PCB lighting ballasts confirmed to be PCB containing, mercury containing waste and service practices that maximize recovery and recycling of ozone-depleting substances (both chlorofluorocarbons [CFCs] and hydro chlorofluorocarbons [HCFCs] and their blends) prior to the disposal of air-conditioning and refrigeration equipment. The work shall be done in accordance with applicable federal, State and local regulations.

1.02 SUMMARY OF WORK

A. The primary and general intent of this project is to remove and properly dispose of PCB-containing ballasts and mercury containing tubes/bulbs during specific construction work efforts indicated in the Contract Documents for the site.

B. The EPA (40 CFR 761.60 and 761.65) and DOHS (22 CCR Section 66508) consider PCBs in ballasts a hazardous waste. As a result, PCB-containing light ballasts and mercury containing tubes/bulbs shall be removed and segregated for proper disposal prior to demolition.

C. All light ballasts shall be inspected for labeling with all ballasts not labeled specifically as “No PCBs”, or “Contains No PCBs” shall be removed from the fixture for disposal as a PCB containing waste.

D. All fluorescent light tubes and HID bulbs shall be removed without breakage and packaged for mercury reclamation. Workers removing ballasts from fixtures shall wear appropriate protective clothing, eye protection, and nitrile or neoprene gloves. Ballasts showing signs of overheating or leakage will require wipe-down of the fixture with clean paper towel/rags after the unit has cooled to room temperature.

E. Ballasts not labeled specifically as “No PCBs”, shall be properly drummed with absorbent for disposal. Contractor shall package and dispose of fluorescent light tubes according to the appropriate local, state and federal regulations.

F. Requirements for the evacuation, recovery and recycling of ozone-depleting substances (both chlorofluorocarbons [CFCs] and hydro chlorofluorocarbons [HCFCs] and their blends) prior to the disposal of air-conditioning and refrigeration equipment. The Contractor is required to employ qualified HVAC technicians to evacuate CFCs from air-conditioning and refrigeration equipment to established vacuum levels prior to dismantling and disposal of such equipment. The recovery or recycling equipment must have been certified by an EPA-approved equipment testing organization.

G. The removal and proper disposal following segregation, characterization and/or waste profiling the universal waste materials tabulated below to an approved landfill as required by the California Environmental Protection Agency, Department of Toxic Substances Control (DTSC), in accordance with Title 22, California Code of Regulations (CCR) Chapter 11, Appendix X and the recovery of refrigerants prior to demolition of the HVAC equipment containing CFCs) and /or (HCFCs) as per the EPA regulations 40 CFR Part 82, Subpart F, under Section 608 of the Clean Air ACT (CAA).

Universal Waste Materials (UWM)

1. 501 West Weber Avenue, Stockton, California

Universal Waste Material (UWM)	Location - Estimated Quantities	Hazard
Florescent Tube	1st through 5th Floor – 1,660	Mercury Vapor and Dust

Lights (4' Length and 2' U Shaped)	tubes	
Florescent Light Ballasts*	1st through 5th Floor – 830 Oil Containing Ballasts	Suspect Polychlorinated Bi Phenyls (PCB) Dielectric and Coolant Fluid
Mercury (Hg) Containing Thermostats	1st Floor – 10 Capsules	Liquid Mercury
Heating Ventilation and Air Conditioning (HVAC) Units	Roof Mounted Packaged HVAC Units - 2 Units	Chlorofluorocarbon's (CFC's)

2. 509 West Weber Avenue, Stockton, California

Universal Waste Material (UWM)	**Location - Estimated Quantities**	**Hazard**
Florescent Tube Lights (4' Length and 2' U Shaped)	Basement through 5th Floor – 1,720 tubes	Mercury Vapor and Dust
Florescent Light Ballasts*	1st through 5th Floor – 860 Oil Containing Ballasts	Suspect Polychlorinated Bi Phenyls (PCB) Dielectric and Coolant Fluid
Mercury (Hg) Containing Thermostats	1st Floor – 4 Capsules	Liquid Mercury
Heating Ventilation and Air Conditioning (HVAC) Units	Roof Mounted Packaged HVAC Units - 2 Units	Chlorofluorocarbon's (CFC's)
High Intensity Discharge (HID) Lights	Exterior Parking Lot – 25 Lights	Mercury, Metal Halide and/or Sodium Vapor

3. * Lighting Ballasts manufactured after 1977 (with a date stamp of 1978 or after) are not suspected to contain PCB oils.

1.03 WASTE DISPOSAL

A. PCB Containing Ballast Disposal

PCB-containing light ballasts shall be segregated prior to disposal. Contractor shall pack the lighting ballasts not specifically identified as "No PCBs" or similar, as a hazardous waste. PCB ballasts will be packed in drums and should not exceed the incinerator requirements of approximately 350-500 pounds per drum.

B. Fluorescent Tube or CFL Disposal

Fluorescent tubes or compact fluorescent lights (CFLs) shall be packed and shipped to a commercial recycler for reclamation of mercury. The recycler shall comply with DOT requirements for manifests and submit copies of manifests to the owner, including a log of shipment dates and quantities. Contractor shall handle, dispose, and/or recycle fluorescent tubes/bulbs in accordance with local, State, and federal regulations. It is the contractors' responsibility to ensure compliance with applicable regulations.

C. CFC/HCFC Disposal

Refrigeration and air-conditioning equipment that is typically dismantled on-site before disposal (e.g., retail food refrigeration, central residential air conditioning, chillers, and industrial process

refrigeration) has to have the refrigerant recovered in accordance with EPA's requirements for servicing prior to their disposal.

Under these requirements, the final person in the disposal chain (e.g., a scrap metal recycler or landfill owner) is responsible for ensuring that refrigerant is recovered from equipment before the final disposal of the equipment. If the final person in the disposal chain accepts appliances that no longer hold a refrigerant charge, that person is responsible for maintaining a signed statement from whom the appliance/s is being accepted. The signed statement must include the name and address of the person who recovered the refrigerant, and the date that the refrigerant was recovered, or a copy of a contract stating that the refrigerant will be removed prior to delivery.

The Contractor shall submit a copy of the statement to the Owner as part of his abatement project close-out documentation.

END OF SECTION 02 09 10 02 09 10

This page intentionally left blank

SECTION 02 41 00
DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Selective demolition of building elements for alteration purposes.

B. Scanning of the existing post-tensioned reinforced concrete floor slabs.

C. Selective demolition to provide all new utilities and utility connections, including any existing construction removal and restoration work. Utility paths are shown diagrammatically on Plans, and it is the Contractor's responsibility to determine the actual routes.

D. Selective site demolition to provide all new underground utilities and utility connections, including all on-site and off-site paving & site improvement removal; all excavation and trenching; and all paving and site improvement restoration work. Utility paths are shown diagrammatically on Plans, and it is the Contractor's responsibility to determine the actual routes.

1.02 RELATED REQUIREMENTS

A. Section 01 10 00 - Summary: Limitations on Contractor's use of site and premises.

B. Section 01 10 00 - Summary: Description of items to be salvaged or removed for re-use by Contractor.

C. Section 01 50 00 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.

D. Section 01 60 00 - Product Requirements: Handling and storage of items removed for salvage and relocation.

E. Section 01 70 00 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.

F. Section 02 41 13 - Selective Site Demolition;

G. Section 03 72 00: FRP reinforcement.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Site Plan: Showing:
   1. Areas for temporary construction and field offices.

C. A submittal plan is required for any coring of attachment to the existing post-tensioned reinforced concrete slabs require scanning to confirm that no damage will occur to existing post-tensioning strands or reinforcement.
   1. The submittal must: first locate, then demonstrate maximum reuse of existing openings and points of attachment, particularly on the underside of slabs.
   2. The submittal must also show areas to be scanned for discovery and avoidance of existing post-tensioning strands and reinforcement.
   3. Refer to structural drawings, and 01 21 00 - Allowances.

D. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

1.04 QUALITY ASSURANCE

A. Demolition Firm Qualifications: Company specializing in the type of work required.

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.01 SCOPE

A. Remove paving and curbs as required to accomplish new work.

B. Remove fences and gates where shown on plans.

C. Remove other items indicated, for salvage, relocation, and recycling.

3.02 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
   1. Obtain required permits.
   2. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
   3. Provide, erect, and maintain temporary barriers and security devices.
   4. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
   5. Do not close or obstruct roadways or sidewalks without permit.
   6. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
   7. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.

B. Do not begin removal until receipt of notification to proceed from City.

C. Protect existing structures and other elements that are not to be removed.
   1. Provide bracing and shoring.
   2. Prevent movement or settlement of adjacent structures.
   3. Stop work immediately if adjacent structures appear to be in danger.

D. Partial Removal of Paving and Curbs: Neatly saw cut at right angle to surface.

3.03 EXISTING UTILITIES

A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.

B. Conduct any destructive investigations necessary, scanning, potholing, etc. to determine actual location of elements of existing construction to remain, report to Owner any findings contrary to that shown or assumed on the drawings and which affect the work.

C. Protect existing utilities to remain from damage.

D. Do not disrupt public utilities without permit from authority having jurisdiction.

E. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to City.

F. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to City.

G. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.

H. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

3.04 SELECTIVE DEMOLITION FOR ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
   1. Verify that construction and utility arrangements are as indicated.
   2. Report discrepancies to Architect before disturbing existing installation.
   3. Conduct any destructive investigations, scanning, etc. necessary to determine actual location of elements of existing construction to remain, report to Owner any findings contrary to that shown or assumed on the drawings and which affect the work.
   4. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.

B. Remove existing work as indicated and as required to accomplish new work.
   1. Remove items indicated on drawings.

C. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove existing systems and equipment as indicated.
   1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components.
   2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
   3. Verify that abandoned services serve only abandoned facilities before removal.
   4. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification.

D. Protect existing work to remain.
   1. Prevent movement of structure; provide shoring and bracing if necessary.
   2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
   3. Repair adjacent construction and finishes damaged during removal work.
   4. Patch as specified for patching new work.

E. Special attention is brought to the need to scan for any new openings or attachments to the existing post-tensioned reinforced concrete slabs in both Building A and Building B. A submittal plan is required for any coring of attachment to the existing post-tensioned reinforced concrete slabs require scanning to confirm that no damage will occur to existing post-tensioning strands or reinforcement. Refer to structural drawings, 02 41 00 - Demolition, and 01 21 00 - Allowances.

3.05 DEBRIS AND WASTE REMOVAL

A. Remove debris, junk, and trash from site.

B. Leave site in clean condition, ready for subsequent work.

C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION 02 41 00

This page intentionally left blank

SECTION 02 41 13

SELECTIVE SITE DEMOLITION

PART 1 - GENERAL

1.01 SUMMARY

A. SECTION INCLUDES:

1. Work required to demolish, modify, salvage, relocate, dispose, and convert existing structures, pavements, utilities, fencing, and miscellaneous items as required for the construction of the improvements as shown on the Drawings and as specified.

2. Protect all on-site personnel and the public at all areas of demolition.

3. Complete erosion and dust control measures as specified in Section 31 25 13.

4. Protect, support, and maintain adjoining structure, utilities, site work facilities, and miscellaneous items surrounding the demolition work from damage or harmful effects.

5. In accordance with all applicable state and local laws, properly dispose of all hazardous materials as required, obtain EPA generator number from the OWNER, and prepare safety plans.

6. Selective site demolition to provide all new underground utilities and utility connections, including all on-site and off-site paving & site improvement removal; all excavation and trenching; and all paving and site improvement restoration work. Utility paths are shown diagrammatically on Plans, and it is the Contractor's responsibility to determine the actual routes.

B. RELATED SECTIONS. See Related Sections for additional requirements applicable to this Section (typical).

1. Section 01 10 00 – Summary.

2. Section 01 40 00 – Quality Requirements.

3. Section 01 50 00 – Temporary Facilities and Controls.

1.02 SELECTIVE SITE DEMOLITION WORK

A. Selective demolition work includes, but is not limited to:

1. General site work: Asphalt and concrete paving and slabs, fencing, storm drainage structures, sidewalks, curbs, gutters, concrete walls and slabs, signs, bollards, utilities, irrigation systems, and landscaping. Demolition of existing site work structures that conflict with the new Work shown on the Drawings.

2. Partial demolition of pavements to allow new work to connect, for conduit penetrations, or otherwise modify existing structures.

1.03 PROTECTION

A. Maintain free and safe passage for all on-site personnel at all times.

B. Prevent movement or settlement of structures or surrounding areas to demolition work. Provide bracing, shoring, and debris barriers as required and assume responsibility for the safety and support of affected structures.

C. Protect existing finishes, equipment, and adjacent work which remains from damage. Cut finish surfaces such as masonry, tile, plaster, wood, gypsum wallboard, concrete, or metals by methods which will terminate or join work in a straight line at an appropriate point of division.

D. Protect existing vegetation, landscaping and irrigation systems to remain.

E. Cease operations and notify the ENGINEER immediately if the safety of any structure or utility appears to be endangered. Take additional precautions to properly support such structure(s) and do not resume demolition operations until safety is restored.

F. Utility locations shown on the Drawings are approximate and may vary from where they are shown. The CONTRACTOR shall contact Underground Service Alert (800-642-2444) and obtain field marking to determine the exact locations of utilities owned by agencies. Record, preserve and protect the field markings.

G. Blasting and the use of explosives shall not be permitted for any demolition work.

H. Promptly repair any damage caused to facilities or landscaping by demolition operations as directed by the ENGINEER and at no additional cost to the OWNER. The minimum quality of repair shall be equal to that which existed prior to the start of the CONTRACTOR's work.

1.04 SCHEDULING

A. Schedule all demolition work to meet the requirements of Section 01 32 00 and minimize disruption to the work of OWNER staff and the public. Exercise due concern and procedures for maintaining plant operation and diligently direct all activities towards maintaining continuous operation of the existing plant and minimizing operation inconvenience.

1.05 CONDITION OF STRUCTURES

A. Conditions existing at the structures and areas to be demolished at the time of the bid period shall be maintained by the OWNER insofar as practical. Minor variations in small piping, electrical equipment, and miscellaneous materials shall be expected by the CONTRACTOR and this work shall be completed at no additional cost to the OWNER.

1.06 DISPOSAL OF MATERIAL REMOVED BY DEMOLITION WORK

A. All materials removed by demolition work shall become the property of the CONTRACTOR as soon as actual demolition is initiated. The CONTRACTOR shall remove demolition materials as soon as possible but in no case shall store materials removed by demolition on the project site longer than 5 working days. Demolition materials other than concrete and soil shall be properly contained in covered waste disposal bins. Concrete and soil shall be tightly stockpiled until removal.

1.07 SUBMITTALS

A. All submittals shall be in accordance with Section 01 33 00.

B. Submit letters to the ENGINEER showing proposed start and finish dates, times, and detailed descriptions of demolition work a minimum of 14 days in advance of such work. See also Section 01 32 00.

PART 2 - PRODUCTS

2.01 PATCHING MATERIALS

A. See Sections 32 12 16 and 32 13 13 for patching materials.

PART 3 - EXECUTION

3.01 SEQUENCE OF WORK

A. The sequence of demolition and the modifications of existing facilities shall be in accordance with

Section 01 32 00.

B. The CONTRACTOR shall mark all facility components to be demolished in advance of demolition to permit ENGINEER review. The purpose of this requirement is to provide an opportunity to avoid unnecessary or erroneous demolition. The CONTRACTOR remains responsible for demolition as shown and specified in the Contract Documents.

C. The CONTRACTOR shall schedule a meeting and meet with the ENGINEER at the site of the proposed demolition in advance of the start of demolition. CONTRACTOR shall ensure that all necessary personnel are present if necessary or requested by the ENGINEER.

3.02 REMOVAL OF STRUCTURES

A. CONTRACTOR shall remove all components of structures shown or required to be removed.

3.03 REMOVAL AND ABANDONMENT OF BURIED PIPING

A. Unless specifically noted on the Drawings to be abandoned-in-place, all abandoned buried piping shall be excavated and removed from the site.

B. Piping specifically noted to be abandoned-in-place shall have each open end filled with concrete grout to a minimum distance of 5 feet or 5 pipe diameters, whichever is greater, unless otherwise specified or shown.

3.04 DEMOLITION OF AND ADJOINING TO ARCHITECTURAL FINISHES

A. Demolition of finishes where adjoining finishes are to remain shall be carefully completed. Such special finishes include terrazzo, tile, stone, concrete, plaster, wood paneling, metal paneling, and drywall. Cuts shall be even, straight, and parallel to surrounding building lines. Over cuts shall not be permitted unless approved by the ENGINEER.

3.05 CLEAN-UP

A. The CONTRACTOR shall remove from the site all debris resulting from the demolition operations as it accumulates and at least 2 times a week. Upon completion of the immediate demolition work, the CONTRACTOR shall thoroughly clean each area, including dusting, vacuuming, sweeping, and window cleaning.

END OF SECTION

This page intentionally left blank

SECTION 03 01 00
MAINTENANCE OF CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cleaning of existing concrete surfaces.

B. Repair of exposed structural, shrinkage, and settlement cracks.

C. Resurfacing of concrete surfaces having spalled areas and other damage.

D. Repair of deteriorated concrete.

E. Repair of internal concrete reinforcement.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Finishing of concrete surface to tolerance; floating, troweling, and similar operations; curing.

B. Section 03 72 00 - Fiber Reinforced Polymer (FRP) Reinforcement; repair of interior concrete slabs.

C. Section 03 92 50 - Concrete Repair Mortars: Strengthening of interior concrete structural slabs.

D. Section 32 13 13 - Concrete Paving: Concrete site paving including concrete repair mortars and concrete dressings at exterior ramp repair.

1.03 REFERENCE STANDARDS

A. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement 2020.

B. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement 2016.

C. ASTM A996/A996M - Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement 2016.

D. ASTM C33/C33M - Standard Specification for Concrete Aggregates 2018.

E. ASTM C150/C150M - Standard Specification for Portland Cement 2020.

F. ASTM C404 - Standard Specification for Aggregates for Masonry Grout 2018.

G. ASTM C881/C881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete 2015.

H. ASTM C928/C928M - Standard Specification for Packaged, Dry, Rapid-Hardening Cementitious Materials for Concrete Repairs 2020.

I. AWS D1.4/D1.4M - Structural Welding Code - Reinforcing Steel 2018.

J. ICRI 310.2R - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair 2013.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Indicate product standards, physical and chemical characteristics, technical specifications, limitations, maintenance instructions, and general recommendations regarding each material.

C. Installer's Qualification Statement.

1.05 QUALITY ASSURANCE

A. Designer Qualifications: Design reinforcement splices under direct supervision of a Professional Structural Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

C. Cleaner Qualifications: Company specializing in, and with minimum of 3 years of experience in, the type of cleaning specified.

D. Installer Qualifications: Company specializing in performing work of the type specified and with minimum of 3 years of documented experience.

PART 2 PRODUCTS

2.01 CLEANING MATERIALS

A. Degreaser:
   1. Manufacturers:
      a. Euclid Chemical Company; Euco Clean and Strip: www.euclidchemical.com/#sle.
      b. L&M Construction Chemicals, Inc, a subsidiary of Laticrete International, Inc; CITREX: www.lmcc.com/#sle.
      c. SpecChem, LLC; Orange Peel-Citrus Cleaner: www.specchemllc.com/#sle.

B. Detergent: Non-ionic detergent.

2.02 CEMENTITIOUS PATCHING AND REPAIR MATERIALS

A. See section 03 92 50, Concrete Repair Mortars.

B. Cementitious Hydraulic Waterstop: Very fast setting, low slump, hand formable, and capable of stopping active water leaks; in-place material resistant to freeze/thaw conditions.
   1. Manufacturers:
      a. Euclid Chemical Company; SPEED PLUG: www.euclidchemical.com/#sle.
      b. Kaufman Products Inc; SurePlug - regular set: www.kaufmanproducts.net/#sle.
      c. W. R. Meadows, Inc; Meadow-Plug or Meadow-Patch 5: www.wrmeadows.com/#sle.

2.03 EPOXY PATCHING AND REPAIR MATERIALS

A. Epoxy Repair Mortar: Epoxy resin mixed with aggregate and other materials in accordance with manufacturer's instructions for purpose intended; comply with pot life and workability limits.
   1. Manufacturers:
      a. ARDEX Engineered Cements; ARDEX BACA: www.ardexamericas.com/#sle.
      b. Euclid Chemical Company; DURALFLEX FASTPATCH: www.euclidchemical.com/#sle.
      c. Kaufman Products Inc; SurePoxy Mortar, SurePoxy HMLV, or SurePoxy HMLV Class B: www.kaufmanproducts.net/#sle.

B. Epoxy Injection Adhesive:
   1. Manufacturers:
      a. Euclid Chemical Company; DURAL FAST SET LV: www.euclidchemical.com/#sle.
      b. Kaufman Products Inc; SurePoxy HM, SurePoxy HMLV, SurePoxy HMLV Class B, or SurePoxy HMSLV: www.kaufmanproducts.net/#sle.
      c. W. R. Meadows, Inc; Rezi-Weld LV, Rezi-Weld LV State, Rezi-Weld (IP), or Rezi-Weld Gel Paste: www.wrmeadows.com/#sle.

C. Epoxy Bonding Adhesive: Non-sag, two-component, 100 percent solids; recommended by manufacturer for purpose and conditions under which used.
   1. Non-Load-Bearing Applications: ASTM C881/C881M Type I, II, III, IV, or V, whichever is appropriate to application.
   2. Manufacturers:
      a. ARDEX Engineered Cements; ARDEX BACA: www.ardexamericas.com/#sle.
      b. Euclid Chemical Company; DURAL FAST SET LV: www.euclidchemical.com/#sle.
      c. W. R. Meadows, Inc; Rezi-Weld Gel Paste: www.wrmeadows.com/#sle.

2.04 ACCESSORIES

A. Anchoring Adhesive: Self-leveling or non-sag as applicable.

1. Self-Leveling Polyester-Based Products:
    a. W. R. Meadows, Inc; Poly-Grip: www.wrmeadows.com/#sle.

B. Portland Cement: ASTM C150/C150M, Type I, grey.

C. Sand: ASTM C33/C33M or ASTM C404; uniformly graded, clean.

D. Water: Clean and potable.

E. Reinforcing Steel: ASTM A615/A615M Grade 40 (40,000 psi) billet-steel deformed bars, unfinished.

F. Reinforcing Steel: Deformed bars, ASTM A996/A996M Grade 40 (280), Type A.
1. Galvanized in accordance with ASTM A767/A767M, Class I.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work.

B. Beginning of installation means acceptance of substrate.

3.02 PREPARATION

A. Prepare concrete surfaces to be repaired according to ICRI 310.2R.

3.03 CLEANING EXISTING CONCRETE

A. Clean concrete surfaces of dirt or other contamination using the gentlest method that is effective.
1. Try the gentlest method first, then, if not clean enough, use a less gentle method taking care to watch for impending damage.
2. Clean out cracks and voids using same methods.

B. The following are acceptable cleaning methods, in order from gentlest to less gentle:
1. Water washing using low-pressure, maximum of 100 psi, and, if necessary, brushes with natural or synthetic bristles.
2. Increasing the water washing pressure to maximum of 400 psi.
3. Adding detergent to washing water; with final water rinse to remove residual detergent.
4. Steam-generated low-pressure hot-water washing.

3.04 CONCRETE STRUCTURAL MEMBER REPAIR

A. See drawings for specific areas to be repaired.

B. Remove broken and soft concrete at least 1/4 inch deep.

C. Mechanically cut away damaged portions of reinforcement.

D. Remove corrosion from steel and clean mechanically.

E. Blast clean remaining exposed reinforcement surfaces.

F. Repair by welding new bar reinforcement to existing reinforcement using sleeve splices.
1. Perform welding work in accordance with AWS D1.4/D1.4M.
2. Make welded sleeve splices to achieve strength to exceed strength of new reinforcement.

G. Follow repair product manufacturer's written installation instructions.

H. Cover exposed steel reinforcement with epoxy mortar.

3.05 CRACK REPAIR USING EPOXY ADHESIVE INJECTION

A. Repair exposed cracks.

B. Provide temporary entry ports spaced to accomplish movement of fluids between ports; no deeper than the depth of the crack to be filled or port size diameter no greater than the thickness of the crack. Provide temporary seal at concrete surface to prevent leakage of adhesive.

C. Inject adhesive into ports under pressure using equipment appropriate for particular application.

D. Begin injection at lower entry port and continue until adhesive appears in adjacent entry port. Continue from port to port until entire crack is filled.

E. Remove temporary seal and excess adhesive.

F. Clean surfaces adjacent to repair and blend finish.

3.06 CONCRETE SURFACE REPAIR USING CEMENTITIOUS MATERIALS

A. Clean concrete surfaces, cracks, and joints of dirt, laitance, corrosion, and other contamination using method(s) specified above and allow to dry.

B. Apply coating of bonding agent to entire concrete surface to be repaired.

C. Fill voids with cementitious mortar flush with surface.

D. Apply repair mortar by steel trowel to a minimum thickness of 1/4 inch over entire surface, terminating at a vertical change in plane on all sides.

E. Trowel finish to match adjacent concrete surfaces.

3.07 FIELD QUALITY CONTROL

A. An independent testing agency, as specified in Section 01 40 00, will perform field inspection and testing.

END OF SECTION 03 01 00

SECTION 03 10 00
CONCRETE FORMING AND ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Formwork for cast-in place concrete, with anchorage.

B. Openings for other work.

C. Form accessories.

D. Form stripping.

1.02 RELATED REQUIREMENTS

A. Section 03 20 00 - Concrete Reinforcing.

B. Section 03 30 00 - Cast-in-Place Concrete.

C. Section 04 20 00 - Unit Masonry: Reinforcement for masonry.

D. Section 05 12 00 - Structural Steel Framing: Placement of embedded steel anchors and plates in cast-in-place concrete.

1.03 REFERENCE STANDARDS

A. ACI 117 - Specifications for Tolerances for Concrete Construction and Materials 2010 (Reapproved 2015).

B. ACI 301 - Specifications for Structural Concrete 2016.

C. COE CRD-C 513 - COE Specifications for Rubber Waterstops 1974.

D. COE CRD-C 572 - Corps of Engineers Specifications for Polyvinylchloride Waterstop 1974.

E. PS 1 - Structural Plywood 2009 (Revised 2019).

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on void form materials and installation requirements.

PART 2 PRODUCTS

2.01 FORMWORK - GENERAL

A. Provide concrete forms, accessories, shoring, and bracing as required to accomplish cast-in-place concrete work.

B. Design and construct concrete that complies with design with respect to shape, lines, and dimensions.

C. Comply with applicable state and local codes with respect to design, fabrication, erection, and removal of formwork.

2.02 WOOD FORM MATERIALS

A. Form Materials: At the discretion of the Contractor.

B. Softwood Plywood: PS 1, C Grade, Group 2.

C. Plywood: Douglas Fir species; solid one side grade; sound undamaged sheets with clean, true edges.

2.03 FORMWORK ACCESSORIES

A. Form Release Agent: Capable of releasing forms from hardened concrete without staining or discoloring concrete or forming bugholes and other surface defects, compatible with concrete and form materials, and not requiring removal for satisfactory bonding of coatings to be applied.

B. Flashing Reglets: Galvanized steel, at least 22 gauge, 0.0299 inch thick, longest possible lengths, with alignment splines for joints, foam filled, release tape sealed slots, anchors for

securing to concrete formwork.

C. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.

D. Embedded Anchor Shapes, Plates, Angles and Bars: As specified in Section 05 12 00.

E. Waterstops: Rubber, complying with COE CRD-C 513, maximum possible lengths, ribbed profile, preformed corner sections, heat welded jointing.

F. Waterstops: PVC, complying with COE CRD-C 572.

G. Waterstops, Chemical-Resistant: Extruded, thermoplastic, virgin rubber; no recycled or reclaimed material or pigments allowed.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.

3.02 EARTH FORMS

A. Earth forms are not permitted.

3.03 ERECTION - FORMWORK

A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 301.

B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.

C. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.

D. Align joints and make watertight. Keep form joints to a minimum.

E. Obtain approval before framing openings in structural members that are not indicated on drawings.

F. Install void forms in accordance with manufacturer's recommendations. Protect forms from moisture or crushing.

G. Coordinate this section with other sections of work that require attachment of components to formwork.

3.04 APPLICATION - FORM RELEASE AGENT

A. Apply form release agent on formwork in accordance with manufacturer's recommendations.

3.05 INSERTS, EMBEDDED PARTS, AND OPENINGS

A. Provide formed openings where required for items to be embedded in passing through concrete work.

B. Locate and set in place items that will be cast directly into concrete.

C. Coordinate with work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other work.

D. Install waterstops in accordance with manufacturer's instructions, so they are continuous without displacing reinforcement. Heat seal joints so they are watertight.

3.06 FORM CLEANING

A. Clean forms as erection proceeds, to remove foreign matter within forms.

B. Clean formed cavities of debris prior to placing concrete.

1. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.

2. During cold weather, remove ice and snow from within forms. Do not use de-icing salts. Do not use water to clean out forms, unless formwork and concrete construction proceed within heated enclosure. Use compressed air or other means to remove foreign matter.

3.07 FORMWORK TOLERANCES

A. Construct formwork to maintain tolerances required by ACI 117, unless otherwise indicated.

3.08 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.

B. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and to verify that supports, fastenings, wedges, ties, and items are secure.

3.09 FORM REMOVAL

A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.

B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.

END OF SECTION 03 10 00

This page intentionally left blank

SECTION 03 20 00
CONCRETE REINFORCING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Reinforcing steel for cast-in-place concrete.

B. Supports and accessories for steel reinforcement.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete.

B. Section 03 72 00 - Fiber Reinforced Polymer (FRP) Reinforcement; repair of interior concrete slabs.

1.03 REFERENCE STANDARDS

A. ACI 301 - Specifications for Structural Concrete 2016.

B. ACI SP-66 - ACI Detailing Manual 2004.

C. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement 2020.

D. ASTM A706/A706M - Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement 2016.

E. CRSI (DA4) - Manual of Standard Practice 2009.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Comply with requirements of ACI SP-66. Include bar schedules, shapes of bent bars, spacing of bars, and location of splices.

C. Manufacturer's Certificate: Certify that reinforcing steel and accessories supplied for this project meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 301.

PART 2 PRODUCTS

2.01 REINFORCEMENT

A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).
   1. Plain billet-steel bars.
   2. Unfinished.

B. Reinforcing Steel: ASTM A706/A706M, deformed low-alloy steel bars.
   1. Unfinished.

C. Reinforcement Accessories:

2.02 RE-BAR SPLICING:

A. Coupler Systems: Mechanical devices for splicing reinforcing bars; capable of developing full steel reinforcing design strength in tension and compression.

B. Dowel Bar Splicer with Dowel-Ins: Mechanical devices for connecting dowels; capable of developing full steel reinforcing design strength in tension and compression.

C. Taper Tie Hole Plug: Mechanical device for plugging tie holes; anchors optional flush or recessed grout.

D. Grout: Cementitious, non-metallic, non-shrink grout for use with manufacturer's grout sleeve reinforcing bar coupler system.

2.03 FABRICATION

A. Fabricate concrete reinforcing in accordance with CRSI (DA4) - Manual of Standard Practice.

B. Welding of reinforcement is not permitted.

PART 3 EXECUTION

3.01 PLACEMENT

A. Place, support and secure reinforcement against displacement. Do not deviate from required position.

3.02 FIELD QUALITY CONTROL

A. An independent testing agency, as specified in Section 01 40 00 - Quality Requirements, will inspect installed reinforcement for compliance with contract documents before concrete placement.

END OF SECTION 03 20 00

SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete for composite floor construction.

B. Elevated concrete slabs.

C. Floors and slabs on grade.

D. Joint devices associated with concrete work.

E. Miscellaneous concrete elements, including equipment pads.

F. Concrete curing.

1.02 RELATED REQUIREMENTS

A. Section 03 10 00 - Concrete Forming and Accessories: Forms and accessories for formwork.

B. Section 03 20 00 - Concrete Reinforcing.

C. Section 03 92 50 - Concrete Repair Mortars.

D. Section 03 72 00 - Fiber Reinforced Polymer (FRP) Reinforcement; repair of interior concrete slabs.

E. Section 07 92 00 - Joint Sealants: Products and installation for sealants and joint fillers for saw cut joints and isolation joints in slabs.

F. Section 32 13 13 - Concrete Paving: Concrete site paving including concrete repair mortars and concrete dressings at exterior ramp repair.

1.03 REFERENCE STANDARDS

A. California Green Building Code; 2016, Supplement - Blue effective July 1, 2018.

B. ACI 117 - Specifications for Tolerances for Concrete Construction and Materials 2010 (Reapproved 2015).

C. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete 1991 (Reapproved 2009).

D. ACI 301 - Specifications for Structural Concrete 2016.

E. ACI 302.1R - Guide to Concrete Floor and Slab Construction 2015.

F. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete 2000 (Reapproved 2009).

G. ACI 305R - Guide to Hot Weather Concreting 2010.

H. ACI 306R - Guide to Cold Weather Concreting 2016.

I. ACI 308R - Guide to External Curing of Concrete 2016.

J. ACI 318 - Building Code Requirements for Structural Concrete 2019, with Errata (2021).

K. ACI 347R - Guide to Formwork for Concrete 2014, with Errata (2017).

L. ASTM C33/C33M - Standard Specification for Concrete Aggregates 2018.

M. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens 2020.

N. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete 2021b.

O. ASTM C150/C150M - Standard Specification for Portland Cement 2020.

P. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method 2016.

Q. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete 2010a (Reapproved 2016).

R. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete 2019.

S. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete 2019.

T. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete 2019.

U. ASTM C685/C685M - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing 2017.

V. ASTM C827/C827M - Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures 2016.

W. ASTM C881/C881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete 2015.

X. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink) 2017.

Y. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures 2020.

Z. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete 2019.

AA. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete 2012.

BB. ASTM E11 - Standard Specification for Woven Wire Test Sieve Cloth and Test Sieves 2020.

CC. ASTM E1643 - Standard Practice for Selection, Design, Installation and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs 2018a.

DD. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs 2017.

EE. COE CRD-C 513 - COE Specifications for Rubber Waterstops 1974.

FF. ICC-ES AC380 - Acceptance Criteria for Termite Physical Barrier Systems 2014, with Editorial Revision (2017).

GG. NSF 61 - Drinking Water System Components - Health Effects 2020.

HH. NSF 372 - Drinking Water System Components - Lead Content 2020.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
   1. For curing compounds, provide data on method of removal in the event of incompatibility with floor covering adhesives.

C. Mix Design: Submit proposed concrete mix design. Meet requirements of CalGreen Measure A5.405.5.2.
   1. Indicate proposed mix design complies with requirements of ACI 301, Section 4 - Concrete Mixtures.

D. Shop Drawing of interior slab plan indicating slopes, elevation points, dimensions, construction joints, transition and edge details, transition between concrete repair mortar, existing slabs and new concrete slabs, reinforcement layout, location of items to be embedded, etc. Coordinate with work under spec section 03 92 50.

E. Samples: Submit samples of underslab vapor retarder to be used.

F. Test Reports: Submit report for each test or series of tests specified.

G. Project Record Documents: Accurately record actual locations of embedded utilities and components that will be concealed from view upon completion of concrete work.

1.05 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 301 and ACI 318.

B. Follow recommendations of ACI 305R when concreting during hot weather.

C. Follow recommendations of ACI 306R when concreting during cold weather.

D. Follow special inspection requirements as shown in the structural drawings.

1.06 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Moisture Emission-Reducing Curing and Sealing Compound, Penetrating: Provide non-prorated warranty to cover cost of flooring delamination failures for 20 years.
   1. Include cost of repair or removal of failed flooring, remediation with a moisture vapor impermeable surface coating, and replacement of flooring with comparable flooring system.

PART 2 PRODUCTS

2.01 FORMWORK

A. Comply with requirements of Section 03 10 00.

2.02 REINFORCEMENT MATERIALS

A. Comply with requirements of Section 03 20 00.

2.03 CONCRETE MATERIALS

A. Use concrete manufactured with cementitious materials in accordance with CalGreen SectionsA5.405.5.2.1 and A5.405.5.2.1.1, as approved by enforcing agency.

B. Cement: ASTM C150/C150M, Type I - Normal Portland type were not specified otherwise in the contract documents.
   1. Acquire cement for entire project from same source.

C. Fine and Coarse Aggregates: ASTM C33/C33M.
   1. Acquire aggregates for entire project from same source.

D. Fly Ash: ASTM C618, Class C or F.

E. Calcined Pozzolan: ASTM C618, Class N.

F. Silica Fume: ASTM C1240, proportioned in accordance with ACI 211.1.

G. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.

2.04 ADMIXTURES

A. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.

B. Air Entrainment Admixture: ASTM C260/C260M.

C. Water Reducing and Accelerating Admixture: ASTM C494/C494M Type E.

D. Water Reducing and Retarding Admixture: ASTM C494/C494M Type D.

E. Accelerating Admixture: ASTM C494/C494M Type C.

F. Shrinkage Reducing Admixture:
   1. ASTM C494/C494M, Type S.

G. Waterproofing Admixture: Admixture formulated to reduce permeability to liquid water, with no adverse effect on concrete properties.
   1. Admixture Composition: Hydrophobic polymer waterproofing and corrosion inhibitor, functioning by closing concrete pores and chemical bonding.

2.05 ACCESSORY MATERIALS

A. Under slab Vapor Retarder:
   1. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations.
   2. Manufacturers:
      a. Fortifiber Building Systems Group; Moistop Ultra 10: www.fortifiber.com/#sle.
      b. Inteplast Group; Barrier-Bac VB-250: www.barrierbac.com/#sle.
      c. ISI Building Products; Viper II Platinum 8-mil (Class A): www.viper2.com/#sle.
      d. Stego Industries, LLC: www.stegoindustries.com/#sle.
      e. W. R. Meadows, Inc; PERMINATOR Class A - 15 mils (0.38 mm): www.wrmeadows.com/#sle.
      f. Substitutions: See Section 01 60 00 - Product Requirements.

B. Termite-Resistant Vapor Barrier Sheet: Plastic sheet complying with ASTM E1745, Class C; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs, and for exclusion of subterranean termites.
   1. Installation: Comply with ASTM E1643.

C. Non-Shrink Cementitious Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
   1. Grout: Comply with ASTM C1107/C1107M.

D. Non-Shrink Epoxy Grout: Moisture-insensitive, two-part; consisting of epoxy resin, non-metallic aggregate, and activator.
   1. Composition: High solids content material exhibiting positive expansion when tested in accordance with ASTM C827/C827M.
      a. Maximum Height Change: Plus 4 percent.
      b. Minimum Height Change: Plus 1 percent.

2.06 BONDING AND JOINTING PRODUCTS

A. Epoxy Bonding System:
   1. Complying with ASTM C881/C881M and of Type required for specific application.
   2. Manufacturers:
      a. Adhesives Technology Corporation: www.atcepoxy.com/#sle.
      b. Euclid Chemical Company; DURAL FAST SET LV: www.euclidchemical.com/#sle.
      c. Substitutions: See Section 01 60 00 - Product Requirements.

B. Waterstops: Rubber, complying with COE CRD-C 513.

C. Waterstops: Bentonite and butyl rubber, complying with NSF 61 and NSF 372.

D. Reglets: Formed steel sheet, galvanized, with temporary filler to prevent concrete intrusion during placement.

E. Termite-Excluding Slab Isolation Joint Filler: 1/2 inch thick, composite sheet of elastomeric membrane, embedded stainless steel termite-exclusion screen, adhesive on both sides, and a disposable, treated release sheet.
   1. Termite Resistance: 100 percent when tested in accordance with ICC-ES AC380.
   2. Stainless Steel Mesh: ASTM E11; opening size 0.018 inch, maximum.

F. Slab Construction Joint Devices: Combination keyed joint form and screed, galvanized steel, with rectangular or round knockout holes for conduit or rebar to pass through joint form at 6 inches on center; ribbed steel stakes for setting.
   1. Provide removable plastic cap strip that forms wedge-shaped joint for sealant installation.
   2. Height: To suit slab thickness.

2.07 CURING MATERIALS

A. Low-Emitting Materials: Products shall comply with VOC limits of authorities having jurisdiction, and all products used inside the weatherproofing membrane of the building shall further comply

with the following VOC limits when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

1. Concrete Curing Compounds: 100g/L

B. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Dayton Superior Corporation; Sure Film (J-74).
      b. L&M Construction Chemicals, Inc.; E-CON.
      c. Meadows, W. R., Inc.; EVAPRE.
      d. Sika Corporation; SikaFilm.

C. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.

D. Moisture-Retaining Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.

E. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

F. Water: Potable.

G. Curing and Sealing Compound, Moisture Emission-Reducing, Penetrating: Liquid for application to newly placed concrete; capable of providing adequate bond for flooring adhesives, initially and over the long term; with sufficient moisture vapor impermeability to prevent deterioration of flooring adhesives due to moisture emission, moisture vapor emission, and alkalinity.
   1. Use this product to cure and seal all new slabs to receive adhesively applied flooring or roofing.
   2. Compressive Strength of Treated Concrete: Equal to or greater than strength after 28-day water cure when tested according to ASTM C39/C39M.
   3. Comply with ASTM C309 and ASTM C1315 Type I Class A.
   4. Manufacturers:
      a. Obex, Creteshield.
      b. Substitutions: See Section 01 60 00 - Product Requirements.
   5. A manufacturer's authorized consultant or Obex technician is required to ber onsite during the application of curing compound.

2.08 CONCRETE MIX DESIGN

A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations and structural drawing requirements (see general notes).

B. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended or required by manufacturer.

C. Normal Weight Concrete:
   1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 4,000 pounds per square inch.
   2. Fly Ash Content: No fly ash allowed.
   3. Calcined Pozzolan Content: Maximum 10 percent of cementitious materials by weight.
   4. Silica Fume Content: Maximum 5 percent of cementitious materials by weight.
   5. Water-Cement Ratio: Maximum 45 percent by weight.
   6. Total Air Content: 4 percent, determined in accordance with ASTM C173/C173M.
   7. Maximum Slump: 3 inches.
   8. Maximum Aggregate Size: 5/8 inch.

2.09 MIXING

A. On Project Site: Mix in drum type batch mixer, complying with ASTM C685/C685M. Mix each batch not less than 1-1/2 minutes and not more than 5 minutes.

B. Transit Mixers: Comply with ASTM C94/C94M.

C. Adding Water: If concrete arrives on-site with slump less than suitable for placement, do not add water that exceeds the maximum water-cement ratio or exceeds the maximum permissible slump.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify lines, levels, and dimensions before proceeding with work of this section.

3.02 PREPARATION

A. Verify that forms are clean and free of rust before applying release agent.

B. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.

C. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning and applying bonding agent in according to bonding agent manufacturer's instructions.
   1. Use epoxy bonding system for bonding to damp surfaces, for structural load-bearing applications, and where curing under humid conditions is required.
   2. Use latex bonding agent only for non-load-bearing applications.

D. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.

E. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade. Comply with ASTM E1643. Lap joints minimum 6 inches. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions. Repair damaged vapor retarder before covering.

3.03 PLACING CONCRETE

A. Place concrete in accordance with ACI 304R.

B. Ensure reinforcement, inserts, waterstops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.

3.04 SEPARATE FLOOR TOPPINGS

A. Prior to placing floor topping, roughen substrate concrete surface and remove deleterious material. Broom and vacuum clean. See special requirements under section 03 92 50, Concrete Repair Mortars.

B. Place required dividers, edge strips, reinforcing, and other items to be cast in.

3.05 CONCRETE FINISHING

A. Repair surface defects, including tie holes, immediately after removing formwork.

B. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch or more in height.

C. Exposed Form Finish: Rub down or chip off and smooth fins or other raised areas 1/4 inch or more in height. Provide finish as follows:

D. Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows:
   1. Surfaces to Receive Thick Floor Coverings: "Wood float" as described in ACI 302.1R; thick floor coverings include quarry tile, ceramic tile, and Portland cement terrazzo with full bed setting system.
   2. Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI 302.1R; thin floor coverings include carpeting, resilient flooring, seamless flooring, resinous matrix terrazzo, thin set quarry tile, and thin set ceramic tile.
   3. Other Surfaces to Be Left Exposed: Trowel as described in ACI 302.1R, minimizing burnish marks and other appearance defects.

E. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains at 1:100 nominal.

3.06 CURING AND PROTECTION

A. Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

3.07 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.

B. Provide free access to concrete operations at project site and cooperate with appointed firm.

C. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.

3.08 DEFECTIVE CONCRETE

A. Test Results: The testing agency shall report test results in writing to Architect and Contractor within 24 hours of test.

B. Defective Concrete: Concrete not complying with required lines, details, dimensions, tolerances or specified requirements.

C. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.

D. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect for each individual area.

3.09 PROTECTION

A. Do not permit traffic over unprotected concrete floor surface until fully cured.

END OF SECTION 03 30 00

This page intentionally left blank

SECTION 03 35 11
CONCRETE FLOOR FINISHES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface treatments for concrete floors and slabs.

B. Clear coatings.

C. Clear penetrating sealers.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Finishing of concrete surface to tolerance; floating, troweling, and similar operations; curing.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with concrete floor placement and concrete floor curing.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's published data on each finishing product, including information on compatibility of different products and limitations.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's sealed packaging, including application instructions.

1.06 FIELD CONDITIONS

A. Maintain light level equivalent to a minimum 200 W light source at 8 feet above the floor surface over each 20 foot square area of floor being finished.

B. Do not finish floors until interior heating system is operational.

C. Maintain ambient temperature of 50 degrees F minimum.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Correct defective work within a two-year period commencing on the Date of Substantial Completion.

PART 2 PRODUCTS

2.01 COATINGS

A. Clear Coating: Clear coating recommended by manufacturer for finishing concrete floors and slabs.
   1. Type: High solids polyurethane; two-component.
   2. Gloss: High gloss.
   3. Color(s): As indicated on drawings.
   4. Products:
      a. SureCrete Design Products; DK 400: www.surecretedesign.com/#sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that floor surfaces are acceptable to receive the work of this section.

B. Verify that flaws in concrete have been patched and joints filled with methods and materials suitable for further finishes.

3.02 GENERAL

A. Apply materials in accordance with manufacturer's instructions.

3.03 COATING APPLICATION

A. Verify that surface is free of previous coatings, sealers, curing compounds, water repellents, laitance, efflorescence, fats, oils, grease, wax, soluble salts, residues from cleaning agents, and other impediments to adhesion.

B. Protect adjacent non-coated areas from drips, overflow, and overspray; immediately remove excess material.

C. Apply coatings in accordance with manufacturer's instructions, matching approved mock-ups for color, special effects, sealing and workmanship.

END OF SECTION 03 35 11

SECTION 03 72 00
FIBER REINFORCED POLYMER (FRP) REINFORCEMENT

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:
   1. The work of this section includes furnishing all labor, materials, equipment, and supervision to prepare the surface of the structural concrete members and to install the FRP reinforcement.

B. Related Sections include the following:
   1. Division 03 Section "Cast-In-Place Concrete" for requirements for concrete slabs and finishes.
   2. Division 03 Section "Repair of Concrete" for requirements of concrete surface repair.

C. Reference Standards
   1. American Concrete Institute (ACI)
      a. ACI 440.2R, Guide for the Design and Construction of Externally Bonded FRP Systems for Strengthening Concrete Structures.
      b. ACI 440R, Report on Fiber-Reinforced Polymer (FRP) Reinforcement for Concrete Structures.
      c. ACI 440 R-96, State of the Art Report on Fiber Reinforced Plastic (FRP) Reinforcement for Concrete Structures.
      d. ACI 503 R, Pull off test to determine FRP adhesion to concrete substrate.

1.03 SUBMITTALS

A. Submit for record Material Safety Data Sheets (MSDS) of each product, used on site.

B. Submit product data indicating product standards, physical and chemical characteristics, environmental durability, technical specifications, limitations, installation instructions, and general recommendations regarding each material.

C. Submit for record, a qualification statement by the Contractor listing their completed FRP Reinforcement projects, including size, locations.

D. Submit for record a complete description of the FRP Reinforcing system materials, surface preparation, applications procedures, application rates and cure times.

E. Submit for record copies of purchase order and packaging slips showing quantities and dates of primer and resin purchased.

F. Submit for review and approval shop drawings including the following:
   1. Limits of FRP Reinforcing.
   2. Details of epoxy injection crack repair and epoxy resin patching.
   3. Complete system details including, but not limited to, FRP Reinforcement, primer, resin, and protective coating.

G. Submit for record test results of the Pull-off test to determine FRP adhesion to concrete substrate.

H. Submit for record Daily Construction Logs kept by the Contractor. These logs shall include the following information: Weather and temperature at application times; Amount of product used, and square footage/linear footage of substrate covered; Batch numbers of all products used; Names of all crew members; Any bond strength tests, noting location, quantity and who performed these tests.

I. Submit an approved ICC/ESR Evaluation Report in the name of the proposed FRP system to be used on this project.

J. Submit independent test report verifying environmental durability of the proposed system to be used on this project. Such reports shall include as a minimum:
   1. 10,000 hr. resistance to high temperature (38c) and high humidity (100%)
   2. 10,000 hr. resistance to alkali solution (pH 9.5)
   3. 3,000 hr. resistance to dry heat (60C)
   4. Resistance to UV/condensation @ 100 cycles.
   5. Resistance to diesel fuel (4 hr. exposure)

K. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for bonding agents, patching mortars, and epoxy adhesives.

1.04 QUALITY ASSURANCE

A. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

B. Quality Control procedure performed by the Manufacturer shall include, but not be limited to the following:
   1. Manufacturer shall have a nationally recognized program of contractor training, certification, and technical support.
   2. The Manufacturer shall have a minimum of ten years' experience in FRP Reinforcement confirmed by actual field tests of a minimum of 50 successful installations.
   3. The Manufacturer shall be able to supply testing data to demonstrate system properties and durability of the actual FRP Reinforcement to be used.

C. Quality Control procedures performed by the Contractor shall include, but not be limited to the following:
   1. The Contractor shall be approved by the Manufacturer and shall have completed a program of instruction in the use of FRP Reinforcement.
   2. The Contractor shall have a minimum of two years' experience in FRP Reinforcement confirmed by actual field test of at least 5 successful installations.
   3. The Contractor shall inspect all materials prior to application to assure that they meet specifications and have arrived at the job-site undamaged.
   4. The FRP reinforcement shall be completed inspected by the contractor during and immediately following application of the composite materials. Conformance with the design drawings, proper alignment of fibers and quality workmanship shall be assured. Entrapped air shall be released or rolled out before the epoxy sets. Defects shall be repaired.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in manufacturer's original and unopened containers, labeled with type and name of products and manufacturers.

B. FRP Reinforcement shall be stored in a cool dry area away from direct sunlight, flame, moisture, or other hazards, as recommended by the manufacturer.

C. Contractor is required to confirm that all materials used in accordance with this Section conform to local, state, and federal environmental and workers safety laws and regulations.

D. During operations Contractor shall maintain barricades.

E. The Contractor shall properly dispose of empty containers in accordance with local regulations.

1.06 PROJECT CONDITIONS

A. Do not apply FRP Reinforcement materials if raining, snowing, or dew condensation is expected, or existing concrete surface is wet or if the ambient or surface temperature are below 40 degrees F.

B. The ambient temperature and temperature of the epoxy components shall be between 50- and 80-degrees F at the time of mixing. See appropriate technical data sheets for more specific instructions.

C. Precautions should be taken to avoid damage to any surface near the work zone due to mixing and handling of the specified material.

D. The Contractor is solely responsible for fume control and shall take necessary precautions against injury to Installer personnel or adjacent building occupants during application of primer and resin, etc. Contractor personnel shall use protective equipment and area shall be well vented to the outside. As a minimum, Installer must take the following precautions:
   1. Contractor to locate and protect building air intake during application.
   2. Contractor to follow all state, federal, and local safety regulations.
   3. Contractor to follow all Manufacturers safety requirements as indicated on appropriate MSDS sheets.

PART 2 PRODUCTS

2.01 FRP REINFORCEMENT FABRIC AND/OR LAMINATE

A. FRP Reinforcement fabric shall be high strength, high modulus, fiber fabric that may be unidirectional or woven to suit specific repair needs.
   1. FRP Reinforcement fabric shall be the type, size, layer, and location as indicated in the structural drawings.
   2. FRP Reinforcement fabric shall meet the minimum strength requirements indicated in the structural drawings.

B. FRP Precured Strip shall be high strength, high modulus, a unidirectional carbon fiber reinforced polymer (CFRP).
   1. FRP Precured Strip shall be the type, size, layer, and location as indicated on the Drawings.
   2. FRP Precured Strip shall meet the minimum strength requirements indicated in the structural drawings.

2.02 CONCRETE SURFACE PRIMER

A. Surface Primer shall be a two component, 100% solids, moisture tolerant, high modulus, high strength epoxy.

B. Surface primer shall meet minimum strength requirements indicated in the structural drawings.

2.03 FABRIC SATURANT

A. Saturant resin shall be two component, 100% solids, moisture tolerant, high strength, and high modulus epoxy.

B. Saturants shall meet the minimum strength requirements indicated in the structural drawings.

2.04 EPOXY REPAIR MORTAR

A. Repair mortar shall be 100% solids, no-sag paste epoxy.

B. Repair mortar shall meet minimum strength requirements indicated in the structural drawings.

2.05 PROTECTIVE COATING AND FIREPROOFING

A. Protective coatings and fireproofing shall meet the design requirements of the project.

PART 3 EXECUTION

3.01 EXAMINATION

A. Inspect surfaces to receive the work and report immediately in writing to the Engineer of Record as required in the General Conditions and deficiencies in the surface that render it unsuitable for proper execution of this work.

B. Protect vehicles, concrete and other items surrounding work area from dust or damage due to Work of this Section.

3.02 PREPARATION

A. All concrete surfaces shall be dry and free of surface moisture and frost and tested by the Contractor to evaluate moisture transmission in accordance with ASTM D4263 “Indicating Moisture in Concrete by the Plastic Sheet Method.”

B. All concrete surfaces shall be sound. Remove deteriorated concrete, dust, laitance, grease, paint, curing compounds, waxes, impregnations, foreign particles, and other bond inhibiting materials from the surface by blast cleaning or equivalent mechanical means.

C. All concrete surfaces shall be air blasted and vacuumed clean to a dust free condition.

D. Concrete surface irregularities less than one inch shall be ground and smoothed and/or filled with an approved repair mortar. Surface irregularities shall be limited to less than 0.04 inches (1mm). Surface irregularities greater than one inch shall be repaired using an approved cementitious repair mortar.

E. External concrete corners shall be rounded to at least a 1/2-inch radius when perpendicular to fiber orientation and internal corners shall be smoothed by trowelling epoxy mortar into the corners.

F. The adhesive strength of the concrete shall be verified after preparation by random pull-off testing (ACI 503R) at the direction of the Engineer of Record. Minimum tensile strength is 200 psi with concrete substrate failure, or as approved by the Engineer of Record.

3.03 APPLICATION

A. Mixing Primer and Saturant
   1. Mix components in accordance with Manufacturer’s recommendations.
   2. Diluting is not permitted. Pre-condition materials as indicated on technical data sheet.
   3. Mix only that quantity which can be sued within its pot life.
   4. Do not batch deliver units into smaller quantities. Miss only full units.

B. Primer Application
   1. Apply primer in accordance with Manufacturer’s recommendations.
   2. Primer may be applied with a brush or roller Apply second coast as necessary after first coat has penetrated into concrete.
   3. Surface depressions shall be filled with epoxy filler per manufacturer’s instructions.
   4. Primer must be covered with fiber within 24 hours of applications, depending on temperature conditions. If 24-hour window is exceeded, the primed surfaces must be solvent wiped with fast flashing solvent or roughened with sandpaper to break the amine blush.

C. FRP Reinforcement Application (Wet Lay-up)
   1. Apply FRP Reinforcement in accordance with Manufacturer recommendations.
   2. When using saturator equipment, follow Manufacturer’s procedures for proper machine set up and calibration. Rollers shall be calibrated to saturate the fabric with the proper resin-to-fabric ratio. The roller gap shall be checked daily by a qualified technician for accuracy. The resin-to-fabric ratio shall also be verified by resin usage and documented on the dial project logs.
   3. Once the fabric is saturated, it may then either be spooled for easy handling, or cut to the specified lengths and booked for handling. Care must be taken not to damage the fibers.
   4. The fabric may then be applied to the surface with no delay. Work from one end to the other, taking care to orient the fibers as specified. Remove any air ent4rapped in the fabric with a ribbed roller or squeegee.
   5. Sheets shall be lapped in the longitudinal direction 6 inches minimum or as indicated on the Drawings. Note, no lapping is required of the sheets parallel to the direction of fiber orientation.

D. Precured Strip Application
   1. Apply FRP Precured Strip in accordance with manufacturer’s recommendations.
   2. Care shall be taken not to damage the fibers in handling and unpacking the Strips.

3. Strips may be either delivered to the project site in factory pre-cut lengths or cut on site. Care must be taken no to fray or otherwise damage the fibers when field cutting. Follow manufacturer's recommendations for field cutting of the strips.
4. Strips shall be cleaned with fast flashing solvent to remove any bond inhibiting materials. A clean white cotton rag shall be used for this purpose. Continue cleaning the Strip in this manner until no black residue shows on the rag. Cleaning shall be performed the same day the strips are to be used.

E. Curing
1. Protect finished installation of FRP Reinforcement from rain, sand, dust, etc. using protective sheeting or other barriers. Do not allow protective sheeting to come in contact with finished application.
2. Curing of finished application shall be a minimum of 24 hours and in order to achieve full strength curing shall be extended for a period of two weeks at an average ambient temperature of 68-degree F.

F. Repair of Defects
1. Upon completion of the curing process, the installed system shall be checked for areas where saturant has not penetrated or where saturant has not completely cured. Such areas shall be epoxy injected to re-establish bond submit to the approval of the Engineer of Record.
2. Repair procedures shall be performed in accordance with guidelines established by ACI 440.2R-08 and approved by the Engineer of Record. All repairs shall be subject to the same application, curing and quality control specifications as the original work.

G. Testing and Sampling
1. Two samples shall be prepared daily. Samples shall consist of two 12 inches by 12-inch layers of fiber.
2. Mix samples of epoxy resin according to manufacturer recommendations. Resin components shall be taken from the same case lots as will be used for construction. The prepared, identified samples shall be tested at random as per owner's requirements. The testing shall consist of the following:
   a. Ultimate tensile strength
   b. Tensile modulus
   c. Percent Elongation.

H. Inspection
1. The inspection agency shall continuously observe all aspects of preparation, mixing, and application of materials, including the following:
   a. Surface preparation
   b. Material container labels
   c. Mixing of epoxy.
   d. Application of epoxy to the fiber.
   e. Curing of the composite materials.
   f. Testing of samples.

END OF SECTION 0372001 03 72 00

SECTION 03 92 50
CONCRETE REPAIR MORTARS

PART 1 - GENERAL

1.01 SUMMARY

A. Portland cement-based structural repair mortar with integral corrosion inhibitor suitable for overlays and full depth repairs.

B. Trowel-grade concrete repair mortar for 1/4" to 2" depth repairs.

1.02 RELATED REQUIREMENTS

A. Drawings, general provisions of the Contract, and other related construction documents such as Division 01 specifications apply to this Section.

B. Section 03 20 00 - Concrete Reinforcing.

C. Section 03 30 00 - Cast-in-Place Concrete: Preparation of subgrade, granular fill, placement of concrete.

D. Section 32 13 13 - Concrete Paving: Concrete site paving including concrete repair mortars and concrete dressings at exterior ramp repair.

1.03 REFERENCES

A. ASTM C 39, Compressive Strength of Cylindrical Concrete Specimens

B. ASTM C 293, Flexural Strength of Concrete

C. ASTM C 469, Static Modulus of Elasticity and Poisson's Ratio of Concrete in Compression

D. ASTM C 157, Length Change of Hardened Hydraulic-Cement Mortar and Concrete

E. ASTM C 496, Splitting Tensile Strength of Cylindrical Concrete Specimens

F. ASTM D 4541, Pull-Off Strength of Coatings Using Portable Adhesion Testers

G. ASTM C 309, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete

H. ICRI Technical Guideline No. 03732 Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays

I. ICRI Technical Guideline No. 03730 Guide for Surface Preparation for the Repair of Deteriorated Concrete Resulting from Reinforcing Steel Corrosion

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used. Include manufacturer's Material Safety Data Sheets.

B. Qualification Data: For Installer.

C. Shop Drawing of interior slab plan indicating slopes, elevation points, dimensions, construction joints, transition and edge details, transition between concrete repair mortar, existing slabs and new concrete slabs, reinforcement layout, location of items to be embedded, etc. Coordinate with work under spec section 03 92 50.

1.05 WARRANTY

A. Manufacturer’s Warranty; Submit, for Owners acceptance, manufacturer’s EXTENDED warranty documents.

1.06 QUALITY ASSURANCE

A. Manufacturer's Qualifications: The manufacturer shall be a company with at least five years experience and regularly engaged in the manufacture and marketing of products specified herein.

B. Installation of the ARDEX product must be completed by an approved Ardex Level Master Elite installer qualified to provided extended warranties using mixing equipment and tools approved

by the manufacturer. Please contact ARDEX Engineered Cements (724) 203-5000 for a list of recommended installers.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver products in original packaging, labeled with product identification, manufacturer, batch number and shelf life.

B. Store products in a dry area with temperature maintained between 50° and 85° F (10° and 29° C) and Protect from direct sunlight.

C. Handle products in accordance with manufacturer's printed recommendations.

1.08 PROJECT CONDITIONS

A. Do not install material below 50° F (10° C) surface and air temperatures. These temperatures must also be maintained during and for 48 hours after the installation of products included in this section. Install quickly if substrate is warm and follow warm weather instructions available from the Ardex Technical Service Department.

PART 2 - PRODUCTS

2.01 REPAIR MORTAR

A. Portland cement-based structural repair mortar with built in corrosion inhibitor for horizontal,
   1. vertical, and overhead applications for exterior and interior concrete above, on or below grade.

B. Manufacturers:
   1. ARDEX Engineered Cements: www.ardexamericas.com/#sle.
   2. The QUIKRETE Companies: www.quikrete.com/#sle.
   3. W. R. Meadows, Inc: www.wrmeadows.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

C. Basis of Design:
   1. Full depth repairs: Ardex "FDX"; Manufactured by Ardex Engineered Cements: 400 Ardex Park Drive, Aliquippa, Pa 15001 USA 724-203-5000.
      a. Performance and Physical Properties: Meet or exceed the following values for material cured at 70° F (20° C) and 50% relative humidity:
         1) Application: Trowel.
            (a) Working Time: 20 - 40 minutes.
            (b) Compressive Strength: 4800 at 7 days, 6000 psi at 28 days, ASTM C39.
            (c) Flexural Strength: 700 psi at 7 days, 750 psi at 28 days, ASTM C293.
            (d) Modulus of Elasticity in Compression: 3.9 x 106 psi at 28 days, ASTM C469, modified.
            (e) Splitting Tensile Strength: 400 psi at 7 days, 600 psi at 28 days, ASTM C496.
            (f) Direct Tensile Bond: 210 psi at 28 days, ASTM D 4541
            (g) Color: Concrete gray.
            (h) Combustibility: Non-combustible, both before and after use.
         2) At areas with exposed rebar sections, apply anti-corrosion inhibitor prior to installation of repair mortar.
   2. Trowel-grade horizontal concrete repair mortar: Ardex "ERM" Manufactured by ARDEX Engineered Cements: 400 Ardex Park Drive, Aliquippa, Pa 15001 USA 724-203-5000.
      a. Performance and Physical Properties: Meet or exceed the following values for material cured at 73° F (23° C) and 50 percent relative humidity:
         1) Application: Trowel.
         2) Working Time: 25 - 45 minutes.
         3) Compressive Strength: 7,000 psi (48.3MPa) at 7 days, 8200 psi (56.58 MPa) at 28 days, ASTM C109.

4) Flexural Strength: 1,200 psi (8.3 MPa) at 7 days, 1,500 psi (10.3 MPa) at 28 days, ASTM C78.
5) Modulus of Elasticity in Compression: 3.67 x 106 psi at 28 days, ASTM C469, modified.
6) Shrinkage: less than 0.06%at 7 days, less than 0.08%at 28 days, ASTM C157, air cured.
7) Rapid Chloride Permeability: 820 Coulombs, at 28 days, ASTM C1202.
8) Low -slump, non-sagging.
9) Color: Concrete gray.
10) Combustibility: Non-combustible, both before and after use.

3. Bonding & Anti-Corrosion Agent: Ardex "Baca" or equal.
   a. Performance and Physical Properties:
      1) ASTM C882 Bond Strength:
         (a) 1,800 at 2 hours (127 kg/cm2)
         (b) 2,100 at 24 hours (148 kg/cm2)
      2) Two component, Portland cement/epoxy-based, brush or spray applied coating
   b. Substrate Preparation:
      1) Prior to proceeding with any repair, please refer to the International Concrete Repair Institute's ICRI 03730 Guide for Surface Preparation for the Repair of Deteriorated Concrete Resulting from Reinforcing Steel Corrosion; ICRI 03732 Guideline for Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays; and the American Concrete Institute's ACI 546R-04 Concrete Repair Guide for general guidelines for concrete repair. Please also refer to the mortar or repair manufacturer's specific recommendations for substrate preparation.
      2) All substrates must be solid, thoroughly clean and free of oil, wax, grease, asphalt, existing patching materials, curing and sealing compounds, and any contaminant that might act as a bond breaker. Over watered, frozen or otherwise weak concrete surfaces must also be cleaned down to sound, solid concrete by mechanical methods such as scarifying or similar in accordance with ICRI 03732to create an exposed aggregate surface with a minimum surface profile of approximately 1/16" (1.6 mm). Acid etching, solvents, sweeping compounds and sanding are not acceptable means of preparing the substrate.
      3) When reinforcing steel is exposed for protection, prepare the concrete such that a minimum 3/4" (19 mm) clearance is achieved under the reinforcement to ensure sufficient placement of anti-corrosion agent when brushed under steel. Remove all rust or active corrosion agents using sandblasting or mechanical wire brushing to produce a white metal finish. Make sure surfaces are clean, dry and free of all contaminants. Apply immediately to clean metal to avoid new corrosion.

PART 3 - EXECUTION

3.01 PREPARATION

A. General: Prepare substrate in accordance with manufacturer's instructions. Prior to proceeding with any repair, please refer to the International Concrete Repair Institute's ICRI 03730 Guide for Surface Preparation for the Repair of Deteriorated Concrete Resulting from Reinforcing Steel Corrosion; ICRI 03732 Guideline for Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays; and the American Concrete Institute's ACI 546R-04 Concrete Repair Guide for general guidelines for concrete repair.
   1. All concrete and masonry substrates must be sound, solid, dry, and completely free of all oil, grease, dirt, curing compounds and any substance that might act as a bond breaker. Overwatered, frozen or otherwise weak concrete surfaces must also be cleaned down to sound, solid concrete by mechanical methods such as scarifying, scabbling or similar in accordance with ICRI 03732 before priming. Acid etching and the use of sweeping compounds and solvents are not acceptable.

2. At areas requiring more than 2" of concrete repair mortar, the repair area must be saw cut in a basic rectangular shape at least 1 1/2” in depth. The cuts should be made at 90° angle, and should be slightly keyed. Chip out the concrete inside the cuts to a minimum depth of 1 1/2” until the area is squared or box shape.
3. At areas requiring less than 2" of concrete repair mortar, the repair area must be saw cut in a basic rectangular shape at least ¼” (6 mm) in depth. The cuts should be made at 90° angle, and should be slightly keyed. Chip out the concrete inside the cuts to a minimum depth of ¼” (6 mm) until the area is squared or box shape.
4. Mechanically prepare surface to obtain an exposed aggregate surface with a minimum surface profile of approximately 1/16” (1.5 mm).
5. For cases with exposed reinforcing steel, mechanically clean the steal to remove all rust and any other contaminants in accordance with ICRI 03730. Prime the steel with "Ardex Bonding & Anti-Corrosion Agent" or equal prior to proceeding with repair. For further details, please refer to the Ardex Technical brochure.
    a. Joint Preparation
        1) Moving Joints and Cracks - honor all expansion and isolation joints up through the concrete repair mortar. A flexible sealing compound suitable for the application may be installed. Ardex "Ardiseal Rapid Plus" or equal may be installed for interior applications only.
            (a) Saw Cuts and Dormant Cracks - greater than 1/16” (1.6mm) should be filled with Ardex "Ardifix" or equal joint filler prior to installing Ardex "FDX".

3.02 INSTALLATION OF REPAIR MORTARS:

A. Examine substrates and conditions under which materials will be installed. Do not proceed with installation until unsatisfactory conditions are corrected.

B. Coordinate installation with adjacent work to ensure proper sequence of construction. Protect adjacent areas from contact due to mixing and handling of materials.

C. Mixing: Comply with manufacturer's printed instructions and the following.
1. Precondition components to temperature of 70° plus or minus 5° F (21° plus or minus 2.5° C) prior to mixing.
2. Pre-dampen the inside of a pail or inside of a clean mortar mixer, and remove any excess water.
3. Add 6.5 pints (3.08 L) of clean potable water, and then add one-third of an 80-pound (36.4 kg) bag. Once this is blended in, add the next third and so on until all of the material is added.
4. Mix using a 1/2” to 3/4” (12 to 19 mm) low speed heavy-duty mixing drill with a heavy gauge square box (butterfly) mixing paddle. Forced action mortar mixers are also suitable. Mix to a uniform, lump-free consistency. For both mixing methods, avoid over mixing, which may entrap air. If additional water is required, you may add up to 8 oz. (0.24L) of additional mix water per bag. Do not overwater.

D. Application: Comply with manufacturer's printed instructions and the following.
1. Do not apply in freezing conditions or during precipitation.
2. Comply with manufacturer’s guides for hot and cold weather application.
3. Dampen substrate to fill concrete pores with water. Remove ponding, glistening, or surface water (saturated surface dry). Alternatively, Ardex "P 71TM" Primer or equal can be used in accordance with the ARDEX Technical brochure. Do not allow the concrete or Ardex "P 71TM" to dry before installing Ardex "FDX". If Ardex Bonding & Anti-Corrosion Agent is specified as a primer, follow the application instructions in the ARDEX Technical Brochure.
4. When overlaying, apply scrub coat of repair mortar into substrate to ensure intimate contact and establish bond. Apply Ardex "FDX" while scrub coat is wet. Consolidate and trowel to the desired finish.
5. When pouring into closed forms, the repairs can be vibrated to ensure full contact and to establish bond with the substrate, as well as ensure proper consolidation. Avoid over-

vibration.

6. Steal trowel the mortar to the desired finish once it takes its initial set.
7. Ardex "FDX" can be installed from a minimum of 1 1/2” up to 8” neat (38mm to 20.3 cm).

E. See Slab Plan Sheet A-102 for transition between trowel grade and full depth repair mortar. Blend mortar per manufacturers instructions. Also see Structural Foundation Plan for area to receive rebar.

F. Any exposed rebar to receive anti-corrosion agent.

G. Curing:
1. Keep surface damp for 48 hours with continuous light water-fogging or curing blanket.
2. If no coating or sealer is to be applied, a water-based curing compound meeting ASTM C309 may be used. Do not use solvent-based curing compounds.
3. Allow to cure a minimum 72 hours before applying any final coatings or sealers.

H. Cleaning: Remove excess material before material cures. If material has cured, remove using mechanical methods that will not damage substrate.

END OF SECTION 03 92 50

SECTION 04 20 00
UNIT MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete block at site enclosures.

B. Mortar and grout.

C. Reinforcement and anchorage.

D. Flashings.

E. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 03 10 00 - Concrete Forming and Accessories: Dovetail slots for masonry anchors.

B. Section 03 20 00 - Concrete Reinforcing: Reinforcing steel for grouted masonry.

C. Section 03 30 00 - Cast-in-Place Concrete: Installation of dovetail slots for masonry anchors.

D. Section 07 11 00 - Elastomeric Coating; finish coat over concrete block.

E. Section 07 92 00 - Joint Sealants: Sealing control and expansion joints.

1.03 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.

B. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement 2020.

C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar 2015.

D. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement 2016, with Editorial Revision (2018).

E. ASTM C55 - Standard Specification for Concrete Building Brick 2017.

F. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units 2016a.

G. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units 2017.

H. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar 2018.

I. ASTM C150/C150M - Standard Specification for Portland Cement 2020.

J. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes 2018.

K. ASTM C270 - Standard Specification for Mortar for Unit Masonry 2019.

L. ASTM C404 - Standard Specification for Aggregates for Masonry Grout 2018.

M. ASTM C476 - Standard Specification for Grout for Masonry 2018.

N. ASTM C1714/C1714M - Standard Specification for Preblended Dry Mortar Mix for Unit Masonry 2016.

O. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures 2016.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.

C. Shop Drawings:
   1. All shop drawings by registered California engineer.
   2. Provide plans, sections, and elevations for Fire Pump enclosure.

3. Indicate pertinent dimensions, materials, anchorage, size and type of fasteners, and accessories for CMU support system.

D. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents. See structural drawings for special inspection requirements.

B. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section with minimum three years of documented experience.

C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

PART 2 PRODUCTS

2.01 CONCRETE MASONRY UNITS

A. Concrete Block: Comply with referenced standards and as follows:
   1. Size: Standard units with nominal face dimensions of 16 by 8 inches and nominal depth of 8 inches.
   2. Special Shapes: Provide non-standard blocks configured for corners.
      a. Provide sloped concrete cap at top of enclosure walls.
   3. Load-Bearing Units: ASTM C90, normal weight.
      a. Solid block, as indicated.
   4. Non-Loadbearing Units: ASTM C129.
      a. Fully grouted block.

2.02 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C150/C150M, Type I; color as required to produce approved color sample.

B. Hydrated Lime: ASTM C207, Type S.

C. Mortar Aggregate: ASTM C144.

D. Grout Aggregate: ASTM C404.

E. Water: Clean and potable.

F. Packaged Dry Material for Mortar for Unit Masonry: Premixed Portland cement, hydrated lime, and sand; complying with ASTM C1714/C1714M and capable of producing mortar of the specified strength in accordance with ASTM C270 with the addition of water only.
   1. Color: Standard gray.

2.03 REINFORCEMENT AND ANCHORAGE

A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi), deformed billet bars; galvanized.

B. Joint Reinforcement: Use ladder type joint reinforcement where vertical reinforcement is involved and truss type elsewhere, unless otherwise indicated.

C. Single Wythe Joint Reinforcement: ASTM A951/A951M.

D. Metal-to-Metal Fasteners: Self-drilling, self-tapping screws; corrosion resistant finish or hot dip galvanized to ASTM A153/A153M.

2.04 FLASHINGS

A. Metal Flashing Materials:

1. Stainless Steel Flashing: ASTM A666, Type 304, soft temper; 26 gauge, 0.0187 inch thick; finish 2B to 2D.

B. Drip Edge: Stainless steel; angled drip with hemmed edge; compatible with membrane and adhesives.

2.05 ACCESSORIES

A. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints.

B. Joint Filler: Closed cell polyvinyl chloride; oversized 50 percent to joint width; self-expanding; in maximum lengths available.

C. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

2.06 MORTAR AND GROUT MIXING

A. Mortar for Unit Masonry: ASTM C270, using the Proportion Specification.
1. Exterior, loadbearing masonry: Type N.
2. Exterior, non-loadbearing masonry: Type N.

B. Grout: ASTM C476; consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches.

C. Admixtures: Add to mixture at manufacturer's recommended rate and in accordance with manufacturer's instructions; mix uniformly.

D. Mixing: Use mechanical batch mixer and comply with referenced standards.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive masonry.

B. Verify that related items provided under other sections are properly sized and located.

C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.02 PREPARATION

A. Direct and coordinate placement of metal anchors supplied for installation under other sections.

B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.03 COURSING

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

C. Concrete Masonry Units:

3.04 PLACING AND BONDING

A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

B. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.

C. Remove excess mortar and mortar smears as work progresses.

D. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

3.05 CAVITY MORTAR CONTROL

A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.

3.06 REINFORCEMENT AND ANCHORAGE - GENERAL

A. Per structural drawings.

3.07 CONTROL AND EXPANSION JOINTS

A. Do not continue horizontal joint reinforcement through control or expansion joints.

B. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.

3.08 TOLERANCES

A. Install masonry within the site tolerances found in TMS 402/602.

B. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.

C. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.

D. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.

E. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.

F. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch.

3.09 CLEANING

A. Remove excess mortar and mortar droppings.

B. Replace defective mortar. Match adjacent work.

C. Clean soiled surfaces with cleaning solution.

3.10 PROTECTION

A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

END OF SECTION 04 20 00

SECTION 05 12 00
STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Structural steel framing members.

B. Structural steel support members and struts.

1.02 RELATED REQUIREMENTS

A. Section 05 31 00 - Steel Decking: Support framing for small openings in deck.

B. Section 05 50 00 - Metal Fabrications: Steel fabrications affecting structural steel work.

1.03 REFERENCE STANDARDS

A. AISC (MAN) - Steel Construction Manual 2011.

B. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges 2016.

C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2014.

D. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless 2018.

E. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold Finished 2013.

F. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.

G. ASTM A242/A242M - Standard Specification for High-Strength Low-Alloy Structural Steel 2004 (Reapproved 2009).

H. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength 2014, with Editorial Revision (2017).

I. ASTM A514/A514M - Standard Specification for High-Yield-Strength, Quenched and Tempered Alloy Steel Plate, Suitable for Welding 2014.

J. ASTM A529/A529M - Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality 2014.

K. ASTM A992/A992M - Standard Specification for Structural Steel Shapes 2011 (Reapproved 2015).

L. ASTM E94/E94M - Standard Guide for Radiographic Examination Using Industrial Radiographic Film 2017.

M. ASTM E164 - Standard Practice for Contact Ultrasonic Testing of Weldments 2013.

N. ASTM E165/E165M - Standard Test Method for Liquid Penetrant Examination for General Industry 2012.

O. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength 2007a.

P. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination 2012.

Q. AWS D1.1/D1.1M - Structural Welding Code - Steel 2015, with Errata (2016).

R. SSPC-SP 3 - Power Tool Cleaning 2018.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:
   1. All shop drawings by registered California engineer.
   2. Indicate profiles, sizes, spacing, locations of structural members, openings, attachments, and fasteners.

3. Connections not detailed.
4. Indicate cambers and loads.
5. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.

C. Designer's Qualification Statement.

D. Fabricator's Qualification Statement.

1.05 QUALITY ASSURANCE

A. Fabricate structural steel members in accordance with AISC (MAN) "Steel Construction Manual."

PART 2 PRODUCTS

2.01 MATERIALS

A. Steel Angles and Plates: ASTM A36/A36M.

B. Steel W Shapes and Tees: ASTM A992/A992M.

C. Rolled Steel Structural Shapes: ASTM A992/A992M.

D. Steel Shapes, Plates, and Bars: ASTM A242/A242M high-strength, corrosion-resistant structural steel.

E. Steel Shapes, Plates, and Bars: ASTM A529/A529M high-strength, carbon-manganese structural steel, Grade 50.

F. Steel Plate: ASTM A514/A514M.

G. Pipe: ASTM A53/A53M, Grade B, Finish black.

H. Shear Stud Connectors: Made from ASTM A108 Grade 1015 bars.

I. Structural Bolts and Nuts: Carbon steel, ASTM A307, Grade Aand galvanized in compliance with ASTM A153/A153M Class C.

J. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

K. Shop and Touch-Up Primer: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.

L. Touch-Up Primer for Galvanized Surfaces: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.

2.02 FABRICATION

A. Shop fabricate to greatest extent possible.

B. Fabricate connections for bolt, nut, and washer connectors.

2.03 FINISH

A. Prepare structural component surfaces in accordance with SSPC-SP 3.

B. Shop prime structural steel members. Do not prime surfaces that will be fireproofed, field welded, in contact with concrete, or high strength bolted.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that conditions are appropriate for erection of structural steel and that the work may properly proceed.

3.02 ERECTION

A. Erect structural steel in compliance with AISC 303.

B. Field weld components and shear studs indicated on shop drawings.

C. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

3.03 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

3.04 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.

B. Welded Connections: Visually inspect all field-welded connections and test at least 50 percent of welds using one of the following:
   1. Radiographic testing performed in accordance with ASTM E94/E94M.
   2. Ultrasonic testing performed in accordance with ASTM E164.
   3. Liquid penetrant inspection performed in accordance with ASTM E165/E165M.

END OF SECTION 05 12 00

This page intentionally left blank

SECTION 05 31 00
STEEL DECKING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Composite floor deck.

B. Supplementary framing for openings up to and including 18 inches.

C. Bearing plates and angles.

D. Stud shear connectors.

1.02 RELATED REQUIREMENTS

A. Section 03 20 00 - Concrete Reinforcing.

B. Section 03 30 00 - Cast-in-Place Concrete: Concrete topping over metal deck.

C. Section 05 12 00 - Structural Steel Framing: Support framing for openings larger than 18 inches and shear stud connectors.

D. Section 05 50 00 - Metal Fabrications: Steel angle concrete stops at deck edges.

E. Section 07 81 00 - Applied Fire Protection: Spray applied fireproofing.

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2014.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.

C. AWS D1.1/D1.1M - Structural Welding Code - Steel 2015, with Errata (2016).

D. ICC-ES AC43 - Acceptance Criteria for Steel Deck Roof and Floor Systems 2016.

E. SDI (DM) - Publication No.30, Design Manual for Composite Decks, Form Decks, and Roof Decks 2007.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittals procedures.

B. Product Data: Provide deck profile characteristics, dimensions, structural properties, and finishes.

C. Shop Drawings: Indicate deck plan, support locations, projections, openings, reinforcement, pertinent details, and accessories.
   1. All shop drawings by registered California engineer.

D. Designer's Qualification Statement.

1.05 QUALITY ASSURANCE

A. Design deck layout, spans, fastening, and joints under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Cut plastic wrap to encourage ventilation.

B. Separate sheets and store deck on dry wood sleepers; slope for positive drainage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Steel Deck:
   1. Canam Steel Corporation: www.canam-steeljoists.ws.
   2. Cordeck, Inc: www.cordeck.com/#sle.

3. Nucor-Vulcraft Group: www.vulcraft.com/#sle.
4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 STEEL DECK

A. All Deck Types: Select and design metal deck in accordance with SDI Design Manual.
   1. Calculate to structural working stress design and structural properties specified.
   2. Maximum Vertical Deflection of Floor Deck: 1/360 of span.
   3. Maximum Lateral Deflection of Diaphragms: 1/500 of the height of the wall.

B. Metal Form Deck: Corrugated sheet steel, with provision for ventilation of concrete:
   1. Galvanized Steel Sheet: ASTM A653/A653M, Structural Steel (SS) Grade 33/230, with G90/Z275 galvanized coating.

2.03 ACCESSORY MATERIALS

A. Bearing Plates and Angles: ASTM A36/A36M steel, galvanized per ASTM A123/A123M.

B. Stud Shear Connectors: Made from ASTM A108 Grade 1015 bars.

C. Welding Materials: AWS D1.1/D1.1M.

D. Mechanical Fasteners: Steel; hex washer head, self-drilling, self-tapping.
   1. Design Requirements for Sidelap Connections: Provide number and type of fasteners that comply with the applicable requirements of SDI (DM) design method for roof deck and floor deck applications and ICC-ES AC43.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions prior to beginning work.

3.02 INSTALLATION

A. Erect metal deck in accordance with SDI Design Manual and manufacturer's instructions. Align and level.

B. On steel supports provide minimum 1-1/2 inch bearing.

C. Drive mechanical sidelap connectors completely through adjacent lapped sheets; positively engage adjacent sheets with minimum three-thread penetration.

D. Weld stud shear connectors through steel deck to structural members below.

END OF SECTION 05 31 00

SECTION 05 40 00
COLD-FORMED METAL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Formed steel stud exterior wall and interior wall framing.

B. Exterior wall sheathing.

C. Formed steel joist and purlin framing and bridging.

D. Water-resistive barrier over sheathing.

1.02 RELATED REQUIREMENTS

A. Section 05 31 00 - Steel Decking.

B. Section 07 21 00 - Thermal Insulation: Insulation within framing members.

C. Section 07 25 00 - Weather Barriers: Weather barrier over sheathing.

D. Section 07 62 00 - Sheet Metal Flashing and Trim: Head and sill flashings.

E. Section 09 21 16 - Gypsum Board Assemblies: Lightweight, non-load bearing metal stud framing.

F. Section 09 24 00 - Cement Plastering.

1.03 REFERENCE STANDARDS

A. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members 2016, with Supplement (2018).

B. ASTM C955 - Standard Specification for Cold-Formed Steel Structural Framing Members 2018, with Editorial Revision.

C. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories 2020.

D. PS 1 - Structural Plywood 2009 (Revised 2019).

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Manufacturer's Installation Instructions: Indicate special procedures, conditions requiring special attention .

1.05 QUALITY ASSURANCE

A. Designer Qualifications: Design framing system under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.

PART 2 PRODUCTS

2.01 FRAMING SYSTEM

A. Provide primary and secondary framing members, bridging, bracing, plates, gussets, clips, fittings, reinforcement, and fastenings as required to provide a complete framing system.

B. Design Requirements: Provide completed framing system having the following characteristics:
   1. Design: Calculate structural characteristics of cold-formed steel framing members according to AISI S100.
   2. Structural Performance: Design, engineer, fabricate, and erect to withstand specified design loads for project conditions within required limits.
   3. Design Loads: In accordance with applicable codes.
   4. Live load deflection meeting the following, unless otherwise indicated:
      a. Floors: Maximum vertical deflection under live load of 1/480 of span.
      b. Roofs: Maximum vertical deflection under live load of 1/240 of span.

c. Exterior Walls: Maximum horizontal deflection under wind load of 1/180 of span.

5. Able to tolerate movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.
6. Able to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.

2.02 FRAMING MATERIALS

A. Studs and Track: ASTM C955; studs formed to channel, C- or Sigma-shaped with punched web; U-shaped track in matching nominal width and compatible height.

2.03 WALL SHEATHING

A. Plywood; PS 1, Grade C-D, Exposure I.

2.04 ACCESSORIES

A. Water-Resistive Barrier: As specified in Section 07 25 00.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

3.02 INSTALLATION OF STUDS

A. Install components in accordance with manufacturers' instructions and ASTM C1007 requirements.

3.03 INSTALLATION OF WALL SHEATHING

A. Install wall sheathing with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using self-tapping screws.
   1. Place water-resistive barrier horizontally over wall sheathing, weather lapping edges, and ends.

END OF SECTION 05 40 00

SECTION 05 50 00
METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Shop fabricated steel items.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Placement of metal fabrications in concrete.

B. Section 04 01 00 - Adhered Masonry Veneer: Placement of metal fabrications in masonry.

C. Section 05 12 00 - Structural Steel Framing: Structural steel column anchor bolts.

D. Section 05 31 00 - Steel Decking: Bearing plates for metal deck bearing, including anchorage.

E. Section 05 52 13 - Pipe and Tube Railings.

F. Section 09 91 13 - Exterior Painting: Paint finish.

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2014.

B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless 2018.

C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.

D. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates 2018.

E. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength 2014, with Editorial Revision (2017).

F. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes 2018.

G. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination 2012.

H. AWS D1.1/D1.1M - Structural Welding Code - Steel 2015, with Errata (2016).

I. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer 1999 (Ed. 2004).

J. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic") 2002 (Ed. 2004).

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
   1. All shop drawings by registered California engineer.
   2. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

A. Steel Sections: ASTM A36/A36M.

B. Steel Tubing: ASTM A500/A500M Grade B cold-formed structural tubing.

C. Plates: ASTM A283/A283M.

D. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.

E. Mechanical Fasteners: Same material as or compatible with materials being fastened; type consistent with design and specified quality level.

F. Bolts, Nuts, and Washers: ASTM A307, Grade A, plain.

G. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

H. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

I. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.02 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.

B. Fabricate items with joints tightly fitted and secured.

C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

D. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.03 FABRICATED ITEMS

A. Ledge Angles, Shelf Angles, Channels, and Plates Not Attached to Structural Framing: For support of joists and masonry; prime paint finish.

B. Door Frames for Overhead Door Openings and Wall Openings: Channel sections; prime paint finish.

2.04 FINISHES - STEEL

A. Prime paint steel items.
   1. Exceptions: Galvanize items to be embedded in concrete and items to be embedded in masonry.

B. Prime Painting: One coat.

C. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M requirements. Provide minimum 1.7 oz/sq ft galvanized coating.

2.05 FABRICATION TOLERANCES

A. Squareness: 1/8 inch maximum difference in diagonal measurements.

B. Maximum Offset Between Faces: 1/16 inch.

C. Maximum Misalignment of Adjacent Members: 1/16 inch.

D. Maximum Bow: 1/8 inch in 48 inches.

E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

3.03 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Obtain approval prior to site cutting or making adjustments not scheduled.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION 05 50 00

This page intentionally left blank

SECTION 05 52 13
PIPE AND TUBE RAILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall mounted handrails.

B. Stair railings and guardrails.

C. Free-standing railings at steps and ADA level landings.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Placement of anchors in concrete.

B. Section 04 20 00 - Unit Masonry: Placement of anchors in masonry.

C. Section 09 21 16 - Gypsum Board Assemblies: Placement of backing plates in stud wall construction.

D. Section 09 91 13 - Exterior Painting: Paint finish.

1.03 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.

B. AISC 201 - AISC Certification Program for Structural Steel Fabricators, Standard for Steel Building Structures 2006.

C. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless 2018.

D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.

E. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings 2021.

F. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination 2012.

G. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer 1999 (Ed. 2004).

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.
   1. All shop drawings by registered California engineer.
   2. Provide elevations of railings with all preliminary dimensions and code citations indicated. Show rail, post embedment, or wall attachment for each case as appropriate.
   3. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications:
   1. A qualified steel fabricator that is certified by the American Institute for Steel Construction (AISC) under AISC 201.

PART 2 PRODUCTS

2.01 RAILINGS - GENERAL REQUIREMENTS

A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of applicable local code.

B. Distributed Loads: Design railing assembly, wall rails, and attachments to resist distributed force of 75 pounds per linear foot applied to the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E935

C. Concentrated Loads: Design railing assembly, wall rails, and attachments to resist a concentrated force of 200 pounds applied at any point on the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E935

D. Allow for expansion and contraction of members and building movement without damage to connections or members.

E. Dimensions: See drawings for configurations and heights.
   1. Top Rails and Wall Rails: 1-1/2 inches diameter, round.
   2. Intermediate Rails: 1-1/2 inches diameter, round.
   3. Posts: 1-1/2 inches diameter, round.

F. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.
   1. For anchorage to concrete, provide inserts to be cast into concrete, for bolting anchors.
   2. For anchorage to masonry, provide brackets to be embedded in masonry, for bolting anchors.
   3. For anchorage to stud walls, provide backing plates, for bolting anchors.

G. Provide welding fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.

2.02 STEEL RAILING SYSTEM

A. Steel Pipe: ASTM A53/A53M Grade B Schedule 80, galvanized finish.

B. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.

C. Exposed Fasteners: No exposed bolts or screws.

D. Galvanizing: In accordance with requirements of ASTM A123/A123M. All exterior steel to be galvanized.

E. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.03 FABRICATION

A. Accurately form components to suit specific project conditions and for proper connection to building structure.

B. Fit and shop assemble components in largest practical sizes for delivery to site.

C. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.

D. Welded Joints:
   1. Exterior Components: Continuously seal joined pieces by intermittent welds and plastic filler. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.
   2. Interior Components: Continuously seal joined pieces by intermittent welds and plastic filler.
   3. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply items required to be cast into concrete or embedded in masonry with setting templates, for installation as work of other sections.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.

C. Anchor railings securely to structure.

D. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per floor level, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION 05 52 13

This page intentionally left blank

SECTION 06 10 00
ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Roofing nailers.

B. Roofing cant strips.

C. Preservative treated wood materials.

D. Fire retardant treated wood materials.

E. Miscellaneous framing and sheathing.

F. Communications and electrical room mounting boards.

G. Concealed wood blocking, nailers, and supports.

H. Miscellaneous wood nailers, furring, and grounds.

1.02 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 03 30 00 - Cast-in-Place Concrete: Setting anchors in concrete.

C. Section 05 50 00 - Metal Fabrications: Miscellaneous steel connectors and support angles for wood framing.

D. Section 07 62 00 - Sheet Metal Flashing and Trim: Sill flashings.

E. Section 09 21 16 - Gypsum Board Assemblies: Gypsum-based sheathing.

1.03 REFERENCE STANDARDS

A. ANSI A208.1 - American National Standard for Particleboard 2016.

B. California Green Building Code; 2016, Supplement - Blue effective July 1, 2018.

C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.

D. ASTM C208 - Standard Specification for Cellulosic Fiber Insulating Board 2012, with Editorial Revision (2019).

E. ASTM C557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing 2003 (Reapproved 2017).

F. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing 2013.

G. ASTM C1396/C1396M - Standard Specification for Gypsum Board 2017.

H. ASTM D2898 - Standard Test Methods for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing 2010 (Reapproved 2017).

I. ASTM D3498 - Standard Specification for Adhesives for Field-Gluing Wood Structural Panels (Plywood or Oriented Strand Board) to Wood Based Floor System Framing 2018a.

J. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2020.

K. AWPA U1 - Use Category System: User Specification for Treated Wood 2018.

L. PS 1 - Structural Plywood 2009.

M. PS 2 - Performance Standard for Wood-Based Structural-Use Panels 2010.

N. PS 20 - American Softwood Lumber Standard 2020.

O. SPIB (GR) - Grading Rules 2014.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: composite wood products showing certification and compliance with CalGreen Section 5.504.4.5.

1.05 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, and installation.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
   1. If no species is specified, provide species graded by the agency specified; if no grading agency is specified, provide lumber graded by grading agency meeting the specified requirements.
   2. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee at www.alsc.org, and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

B. All wood used in millwork (including doors, door frames, window sashes and frames), casework, including blocking used for millwork and door frames is allowed to be combustible per CBC 603.1.

C. All wood not listed under 2.01B shall be fire-retardant-treated wood meeting requirements of Type II construction.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

A. Grading Agency: Southern Pine Inspection Bureau, Inc; SPIB (GR).

B. Sizes: Nominal sizes as indicated on drawings, S4S.

C. Any dimensional used shall be fire-retardant-treated wood meeting requirements of Type II construction.

D. Moisture Content: S-dry or MC19.

E. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
   1. Lumber: S4S, No. 2 or Standard Grade.
   2. Boards: Standard or No. 3.

2.03 CONSTRUCTION PANELS

A. Any sheathing or wood underlayment used shall be fire-retardant-treated wood meeting requirements of Type II construction.

B. Composite wood products. Hardwood plywood, particleboard and medium density fiberboard composite wood products used on the interior or exterior of the building shall meet the requirements for formaldehyde as specified in ARB's Air Toxics Control Measure (ATCM) for Composite Wood (17 CCR 93120 et seq.) Those materials not exempted under the ATCM must meet the specified emission limits, as shown in CalGreen Table 5.504.4.5.

C. Underlayment: APA Underlayment; plywood, Exposure 2, 1/2 inch thick. Fully sanded faces at resilient flooring.

D. Roof Sheathing: Oriented strand board wood structural panel; PS 2, with factory-applied fire-retardant treatment and fire-resistant cementitious facer.
   1. Grade: Structural 1 Sheathing.
   2. Bond Classification: Exposure 1.

3. Performance Category: 5/8 PERF CAT.
4. Span Rating: 40/20.
5. Edges: Square.

E. Wall Sheathing: Plywood, PS 1, Grade C-D, Exposure I.

F. Wall Sheathing: Particleboard, ANSI A208.1, Grade M-3 EXTERIOR GLUE.

G. Wall Sheathing: Fiberboard, ASTM C208, Type IV, Grade 1 regular, square edges.

H. Wall Sheathing: Gypsum, complying with requirements of ASTM C1396/C1396M for gypsum sheathing, V-shaped long edges, 5/8 inch Type X fire resistant.

I. Wall Sheathing: Glass mat faced gypsum, ASTM C1177/C1177M, 5/8 inch Type X fire resistant.

2.04 ACCESSORIES

A. Fasteners and Anchors:
1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
2. Drywall Screws: Bugle head, hardened steel, power driven type, length three times thickness of sheathing.

B. Construction Adhesives: Adhesives complying with ASTM C557 or ASTM D3498.

2.05 FACTORY WOOD TREATMENT

A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
1. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.

B. Fire Retardant Treatment:
1. Exterior Type: AWPA U1, Category UCFB, Commodity Specification H, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes both before and after accelerated weathering test performed in accordance with ASTM D2898.
a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
b. Do not use treated wood in direct contact with the ground.
2. Interior Type A: AWPA U1, Use Category UCFA, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes.
a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
b. Treat rough carpentry items as indicated .
c. Do not use treated wood in applications exposed to weather or where the wood may become wet.

PART 3 EXECUTION

3.01 PREPARATION

A. Coordinate installation of rough carpentry members specified in other sections.

3.02 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.03 BLOCKING, NAILERS, AND SUPPORTS

A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

B. In framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to code authorities may be used in lieu of solid wood blocking.

C. In metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing.

D. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.

E. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

3.04 ROOF-RELATED CARPENTRY

A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.

B. Provide wood curb at all roof openings except where specifically indicated otherwise. Form corners by alternating lapping side members.

3.05 INSTALLATION OF CONSTRUCTION PANELS

A. Subflooring/Underlayment Combination: Glue and nail to framing; staples are not permitted.

B. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using nails, screws, or staples.

3.06 TOLERANCES

A. Framing Members: 1/4 inch from true position, maximum.

B. Variation from Plane, Other than Floors: 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

3.07 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

3.08 CLEANING

A. Waste Disposal: See Section 01 74 19 - Construction Waste Management and Disposal.
   1. Comply with applicable regulations.
   2. Do not burn scrap on project site.
   3. Do not burn scraps that have been pressure treated.
   4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or “waste-to-energy” facilities.

B. Do not leave wood, shavings, sawdust, etc. on the ground or buried in fill.

C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION 06 10 00

SECTION 06 20 00
FINISH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Finish carpentry items.
B. Chair rail at tambour Wainscot
C. Tambour wall paneling.
D. Hardood veneer.
E. Wood door frames, glazed frames.
F. Hardware and attachment accessories.

1.02 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.
B. Section 05 50 00 - Metal Fabrications: Steel Mount Louver Frame.
C. Section 06 10 00 - Rough Carpentry: Support framing, grounds, and concealed blocking.
D. Section 06 41 00 - Architectural Wood Casework: Shop fabricated custom cabinet work.
E. Section 09 72 00 - FRP Panels: FRP Wainscot.
F. Section 09 54 23 - Linear Wood Ceilings.
G. Section 09 91 13 - Exterior Painting: Painting of finish carpentry items.
H. Section 09 91 23 - Interior Painting: Painting of finish carpentry items.
I. Section 09 65 00 - Resilient Flooring: Resilient Base FRP Wainscot.

1.03 REFERENCE STANDARDS

A. 2019 California Green Building Standatrds Code - Non-Residential Mandatory Measures.
B. ANSI A135.4 - Basic Hardboard 2012 (R2020).
C. ANSI A208.1 - American National Standard for Particleboard 2016.
D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2020.
E. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition 2014, with Errata (2016).
F. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 4.0 2021.
G. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood 2016.
H. NEMA LD 3 - High-Pressure Decorative Laminates 2005.
I. PS 1 - Structural Plywood 2009.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with plumbing rough-in, electrical rough-in, and installation of associated and adjacent components.

1.05 SUBMITTALS

A. Document compliance with CalGreen Section 5.504.4.5 for composite wood products.
B. Submit manufacturer's printed statement or product data indicating that composite wood, agrifiber products and laminating adhesives contain no added urea formaldehyde (NAUF).
C. Product data shall be provided indicating the location of raw material harvest/extraction and manufacture.

D. Product data shall be provided indicating the levels of post- and pre-consumer recycled content.

E. See Section 01 30 00 - Administrative Requirements for submittal procedures.

F. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
   1. Provide the information required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).
   2. Include certification program label.
   3. Provide typical shop drawings for wainscot condition at wall base, chair rail, window sill intersections, corner joints inside and out. Indicate thicknesses of all materials. Indicate edge treatment - kerf cut. Indicate stain - tung oil.

G. Certificate: Submit labels and certificates required by quality assurance and quality control programs.

1.06 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
   1. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.

B. Quality Certification:
   1. Provide labels or certificates indicating that the work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.
   2. Provide designated labels on shop drawings as required by certification program.
   3. Provide designated labels on installed products as required by certification program.
   4. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect from moisture damage.

PART 2 PRODUCTS

2.01 FINISH CARPENTRY ITEMS

A. All composite wood, agrifiber products and laminating adhesives that contain no added urea formaldehyde (NAUF). All composite wood on installed within the weatherproofing barrier of the project must comply with this requirement. All laminating adhesives, regardless of installation or whether shop-applied, must comply with this requirement.

B. New wood products that are not reused, salvaged, or recycled must be certified to the standards of the Forest Stewardship Council.

C. These materials, when possible, shall have sourced, harvested/extracted and manufactured within a 500 mile radius of the project.

D. These materials shall have the highest possible levels of recycled content.

E. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

F. All wood and laminated material to meet or exceed Class C flame spread index rating when tested in accordance with NFPA 286 per CBC 803.11 and 803.12. Combustible wood material is not allowed in bearing or non-bearing walls.

G. Interior Woodwork Items:
   1. Moldings, Bases, Casings, and Miscellaneous Trim: Clear white pine; prepare for paint finish.

2.02 HARDWOOD TAMBOUR PANELS

A. Basis of Design Manufacturer: SurfacingSolution.com; Contact Drew Dauer 952-448-6566.

B. Profile and dimensions as shown on drawings.

C. Finish: as noted in the drawings.

D. Backing to be minimum 14.5 oz yard No. 10 100% cotton canvas duck, premium quality.

E. Glue hardwood to backing using any of the following manufacturer's:
   1. Old Brown Glue: 619-268-0864. www.oldbrownglue.com.
   2. Tambour Roll Door Glue: Kennedy Hardware, 10655 Andrade Drive, Zionville, IN. 46077 . 1 -800-62 1 - 1 245. www.kennedyhardware.com.

F. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 LUMBER MATERIALS

A. Softwood Lumber: douglas fir species, S4S sawn, maximum moisture content of 6 percent; with vertical grain, of quality suitable for transparent finish.

B. All casework wood and laminated material to meet or exceed Class C flame spread index rating when tested in accordance with NFPA 286 per CBC 803.11 and 803.12.

2.04 SHEET MATERIALS

A. Softwood Plywood, Not Exposed to View: Any face species, medium density fiberboard core; PS 1 Grade A-B, glue type as recommended for application.

B. Softwood Plywood, Exposed to View: Face species as indicated, plain sawn, medium density fiberboard core; PS 1 Grade A-B, glue type as recommended for application.

C. Hardwood Plywood: Face species as indicated, plain sawn, book matched, medium density fiberboard core; HPVA HP-1 Front Face Grade AA Back Face Grade 1, glue type as recommended for application.

D. Particleboard: ANSI A208.1; Composed of wood chips, sawdust, or flakes of medium density, made with waterproof resin binders; of grade to suit application; sanded faces.

E. Hardboard: ANSI A135.4; Pressed wood fiber with resin binder, Class 1 - Tempered, 1/4 inch thick, smooth one side (S1S).

2.05 PLASTIC LAMINATE MATERIALS

A. Plastic Laminate: NEMA LD 3; color as selected by Architect; textured, low gloss finish.
   1. Products:
      a. Formica.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

2.06 ACCESSORIES

A. Primer: Alkyd primer sealer.

B. Wood Filler: Solvent base, tinted to match surface finish color.

2.07 HARDWARE

A. Standard Shelf, Countertop, and Workstation Brackets:
   1. Material: Steel.
   2. Color: Selected by Architect from manufacturer's standard range.
   3. Products:
      a. Substitutions: See Section 01 60 00 - Product Requirements.

2.08 WOOD TREATMENT

A. Fire Retardant Treatment (FR-S Type): Chemically treated and pressure impregnated; capable of providing flame spread index of 25, maximum, and smoke developed index of 450, maximum, when tested in accordance with ASTM E84.

B. Provide identification on fire retardant treated material.

2.09 FABRICATION

A. Shop assemble work for delivery to site, permitting passage through building openings.

B. Cap exposed plastic laminate finish edges with material of same finish and pattern.

C. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

D. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.

2.10 FINISHING

A. Sand work smooth and set exposed nails and screws.

B. Apply wood filler in exposed nail and screw indentations.

C. On items to receive transparent finishes, use wood filler that matches surrounding surfaces and is of type recommended for the applicable finish.

D. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:

1. Transparent:
    a. Any wood potentially in contact with building occupants, treat with 3 coats of Tung Oil; otherwise, per manufacturer's recommendations.
    b. Sheen: Flat.
2. Opaque:
    a. System - 1, Lacquer, Nitrocellulose.
    b. Color: As selected by Architect.
    c. Sheen: Flat.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

3.02 INSTALLATION

A. Install custom fabrications in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.

B. Set and secure materials and components in place, plumb and level.

C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.

3.03 PREPARATION FOR SITE FINISHING

A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.

B. Before installation, prime paint surfaces of items or assemblies to be in contact with cementitious materials.

3.04 TOLERANCES

A. Maximum Variation from True Position: 1/16 inch.

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

END OF SECTION 06 20 00

SECTION 06 41 00
ARCHITECTURAL WOOD CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Specially fabricated cabinet units.

B. Specially fabricated casework units at custom dais and speaker podium.

C. Hardwood tambour at dais and speaker podium casework.

D. Radiused plywood.

E. Radiused Hardwood veneer plywood.

F. Plywood backings.

G. Plastic Laminates.

H. Hardware.

I. Hardwood benches and counters.

J. Factory finishing.

K. Casework, Caps, and Trims.

1.02 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 06 10 00 - Rough Carpentry: Support framing, grounds, and concealed blocking.

C. Section 09 72 00 - FRP Panels: At Wainscots.

D. Section 12 36 00 - Countertops.

1.03 REFERENCE STANDARDS

A. 2019 California Green Building Standatrds Code - Non-Residential Mandatory Measures.

B. AWI (QCP) - Quality Certification Program Current Edition.

C. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 4.0 2021.

D. BHMA A156.9 - American National Standard for Cabinet Hardware 2015.

E. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood 2016.

F. NEMA LD 3 - High-Pressure Decorative Laminates 2005.

G. UL (DIR) - Online Certifications Directory Current Edition.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting not less than one week before starting work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

A. Document compliance with CalGreen Section 5.504.4.5 for composite wood products.

B. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

C. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.

1. Scale of Drawings: 1-1/2 inch to 1 foot, minimum.
2. Provide the information required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).
3. Casework shop drawings shall show coordination with all required equipment items, including but not limited to dishwashers, sinks, refrigerators, ranges, microwaves, and range hoods and ducts. Any conflicts with fit or installibility of equipment items shall be noted.

D. Product Data: Provide data for hardware accessories.

E. Samples: Submit up to two full scale test sections showing casework construction, minimum 24 inches (609.6 mm) wide, illustrating proposed tambour application, wood species type and finish, hardwood cap construction. Two test samples to allow for test of variation in application of tambour finish type and finish. Final sample to be approved by Engineer and Architect prior to construction of casework.

F. Samples: 12"x12" square samples of each veneer and hardwood type indicating species and finish.

G. Certificate: Submit labels and certificates required by quality assurance and quality control programs.

1.06 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
   1. Company with at least one project in the past 5 years with value of woodwork within 20 percent of cost of woodwork for this Project.
   2. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.

B. Quality Certification:
   1. Comply with AWI (QCP) woodwork association quality certification service/program in accordance with requirements for work specified in this section: www.awiqcp.org/#sle.
   2. Provide labels or certificates indicating that the installed work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.
   3. Provide designated labels on shop drawings as required by certification program.
   4. Provide designated labels on installed products as required by certification program.
   5. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.
   6. Replace, repair, or rework all work for which certification is refused.

1.07 MOCK-UP

A. Provide mock-up of typical base cabinet, wall cabinet, and countertop, including hardware, finishes, and plumbing accessories.

B. See Section 01 40 00 - Quality Requirements for additional requirements.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Protect units from moisture damage.

1.09 FIELD CONDITIONS

A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Creative Wood: www.creativewood.net. Contact: Bill Halsey. Phone. 510-635-5399.

B. Elite Wood Design: www.EliteWoodCA.com. Contract: Dave Gwiazdon. Phone 916-853-2002.

C. Moore Newton Quality Hardwoods: www.moorenewton.com. Phone. 510-317-6500.

D. Sacramento Cabinet: www.saccabinetinc.com. Contact: Robert Grossman. Phone. 916-233-8031.

E. Substitutions: See Section 01 60 00 - Product Requirements.

F. These materials, when possible shall sourced, harvested/extracted and manufactured within a 500 mile radius of the project.

G. Single Source Responsibility: Provide and install this work from single fabricator.

2.02 CASEWORK, CAPS, AND TRIM

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Wood Veneer Faced Cabinet:
   1. Exposed Surfaces: HPVA HP-1 Grade A, Ash, plain sliced, random-matched.
   2. Semi-Exposed Surfaces: HPVA HP-1 Grade B, Ash, plain sliced, random-matched.
   3. Concealed Surfaces: Manufacturer's option.

C. Hardwood Tambour:
   1. Profile and dimensions as shown on drawings.
   2. Finish: as noted in the drawings.
   3. Backing to be minimum 14.5 oz yard No. 10 100% cotton canvas duck, premium quality.
   4. Glue hardwood to backing using any of the following manufacturer's:
      a. Old Brown Glue: 619-268-0864. www.oldbrownglue.com.
      b. Tambour Roll Door Glue: Kennedy Hardware, 10655 Andrade Drive, Zionville, IN. 46077 . 1-800-621-1245. www.kennedyhardware.com.
      c. Substitutions: See Section 01 60 00 - Product Requirements.

D. Hardwood Caps and Trim:
   1. Profile and dimensions as shown on drawings.
   2. Finish: as noted in the drawings or as selected by architect.

E. Radiused hardwood veneer plywood: 3 layers of 1/4" plywood laminated to achieve required radius for 3/4" total thickness with hardwood veneer on outside face. See Detail A4/A-561.

F. Radiused plywood: 3 layers of 1/4" plywood laminated to achieve required radius for 3/4" total thickness. See Detail A4/A-561.

G. Plywood backings.

H. Plastic Laminate Faced Cabinets: Custom grade.

2.03 WOOD-BASED COMPONENTS

A. Wood fabricated from old growth timber is not permitted.

B. Hardwood Plywood: HPVA HP-1 Grade A; veneer core, type of glue recommended for application; of grain quality suitable for transparent finish.

C. Particleboard: Composed of wood chips, medium density, with waterproof resin binders; of grade to suit application; sanded faces; complying with ANSI 4208.1.

D. Lumber: Maximum moisture content of 6 percent; with vertical grain, of quality suitable for transparent finish.

E. Hardwood Edgebanding: Use solid hardwood edgebanding matching species, color, grain, and grade for exposed portions of cabinetry.

2.04 PLASTIC LAMINATE MATERIALS

A. Manufacturers:
   1. Formica Corporation: www.formica.com/#sle.
   2. Panolam Industries International, Inc: www.panolam.com/#sle.
   3. Wilsonart LLC: www.wilsonart.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Type: Plastic laminate

C. Color(s): as indicated on drawings. See I1-101 Finish Legend

D. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.

2.05 COUNTERTOPS

A. See Section 12 36 00 - Countertops.

2.06 ACCESSORIES

A. Adhesive: Type recommended by fabricator to suit application.

B. Fasteners: Size and type to suit application.

C. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel or chrome-plated finish in exposed locations.

D. Concealed Joint Fasteners: Threaded steel.

E. Grommets: Standard plastic, painted metal, or rubber grommets for cut-outs, in color to match adjacent surface.

F. Electric height adjustable speaker podium: per manufacturers recommendations and as approved by Architect. Comply with minimum accessibility clearances as indicated on plans.

2.07 HARDWARE

A. Hardware: BHMA A156.9, types as recommended by fabricator for quality grade specified.

B. Adjustable Shelf Supports: Standard side-mounted system using recessed metal shelf standards or multiple holes for pin supports and coordinated self rests, polished chrome finish, for nominal 1 inch spacing adjustments.

C. Adjustable Shelf Supports: Standard back-mounted system using surface mounted metal shelf standards and coordinated cantilevered shelf brackets, satin chrome finish, for nominal 1 inch spacing adjustments.

D. Fixed Specialty Workstation and Countertop Brackets:
   1. Material: Steel.
   2. Finish: Manufacturer's standard, factory-applied powder coat.
   3. Color: Selected by Architect from manufacturer's standard range.

E. Fixed Americans with Disabilities Act (ADA)-Compliant Vanity and Countertop Brackets:
   1. Material: Steel.
   2. Finish: Manufacturer's standard, factory-applied primer.
   3. Products:
      a. A&M Hardware, Inc; ADA Vanity Brackets: http://www.aandmhardware.com/#sle.
      b. Rakks/Rangine Corporation; ADA Compliant Rakks EHV Vanity Supports: www.rakks.com/#sle.
      c. Substitutions: See Section 01 60 00 - Product Requirements.

F. Drawer and Door Pulls: "U" shaped wire pull, steel with chrome finish, 4 inch centers.

G. Cabinet Locks: Keyed cylinder, two keys per lock, master keyed, steel with chrome finish.

H. Cabinet Catches and Latches:
   1. Type: Friction catch.
   2. Manufacturers:
      a. Knape & Vogt Manufacturing Company: www.knapeandvogt.com/#sle.
      b. Rockler Companies, Inc: www.rockler.com/#sle.
      c. Sugatsune America, Inc: www.sugatsune.com/#sle.
   3. Substitutions: See Section 01 60 00 - Product Requirements.

I. Drawer Slides:
   1. Type: Extension types as indicated.
   2. Static Load Capacity: Commercial grade.
   3. Mounting: Side mounted.
   4. Stops: Integral type.

5. Features: Provide self closing/stay closed type.
6. Manufacturers:
   a. Accuride International, Inc; Heavy-Duty Drawer Slides: www.accuride.com/#sle.
   b. Blum, Inc; MOVENTO: www.blum.com/#sle.
   c. Knape & Vogt Manufacturing Company; Heavy-Duty Drawer Slides: www.knapeandvogt.com/#sle.
   d. Substitutions: See Section 01 60 00 - Product Requirements.

J. Hinges: European style concealed self-closing type, steel with nickel-plated finish.
1. Manufacturers:
   a. Blum, Inc; CLIP top BLUMOTION: www.blum.com/#sle.
   b. Grass America Inc: www.grassusa.com/#sle.
   c. Hardware Resources: www.hardwareresources.com/#sle.
   d. Substitutions: See Section 01 60 00 - Product Requirements.

2.08 SHOP TREATMENT OF WOOD MATERIALS

A. Provide UL (DIR) listed and approved identification on fire retardant treated material.

B. Deliver fire retardant treated materials cut to required sizes. Minimize field cutting.

2.09 SITE FINISHING MATERIALS

A. Stain, Shellac, Varnish, and Finishing Materials: In compliance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

2.10 FABRICATION

A. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.

B. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.

C. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.

D. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.
1. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.
2. Cap exposed plastic laminate finish edges with material of same finish and pattern.

E. Matching Wood Grain: Comply with requirements of quality standard for specified Grade and as follows:
1. Provide center matched panels at each elevation.

F. Mechanically fasten back splash to countertops as recommended by laminate manufacturer at 16 inches on center.

G. Provide cutouts for plumbing fixtures. Verify locations of cutouts from on-site dimensions. Prime paint cut edges.

2.11 SHOP FINISHING

A. Sand work smooth and set exposed nails and screws.

B. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
1. Transparent:
   a. Stain: As selected by Architect.
   b. Sheen: Flat.
   c. Products:
      1) Sherwin-Williams Sher-Wood F3 Hi-Bild Precat Lacquer, Transparent, AWI Finishing System 2: www.sherwin-williams.com/#sle.

2) Sherwin-Williams Sher-Wood F3 Kemvar Conversion Varnish, AWI Finishing System 5: www.sherwin-williams.com/#sle.
3) Sherwin-Williams Sayerlack Hydroplus Waterborne Clear, AF71 Series, ASI Finishing System 8: www.sherwin-williams.com/#sle.
4) Substitutions: Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify location and sizes of utility rough-in associated with work of this section.

3.02 INSTALLATION

A. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.

B. Use fixture attachments in concealed locations for wall mounted components.

C. Use concealed joint fasteners to align and secure adjoining cabinet units.

D. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.

E. Secure cabinets to floor using appropriate angles and anchorages.

F. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.

3.03 ADJUSTING

A. Adjust installed work.

B. Adjust moving or operating parts to function smoothly and correctly.

3.04 CLEANING

A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION 06 41 00

SECTION 07 11 00
ELASTOMERIC WALL COATING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Provide all labor material, tools, equipment, transportation and services necessary for or incidental to preparation of substrates and application of elastomeric coating to all exterior finish insulation system (EIFS) surfaces on exterior building walls, including both new and existing surfaces.

B. Base bid includes:
   1. EIFS Coating No. 2 on all existing and new EIFS surfaces.

C. Alternate bid includes:
   1. EIFS Coating No. 1 on all existing and new EIFS surfaces, in lieu of EIFS Coating No. 2.

1.02 RELATED SECTIONS

A. Section 01 22 00 – Unit Prices

B. Section 01 23 00 - Alternates

C. Section 07 24 01 - Repair to Existing Exterior Finish Insulation System

D. Section 07 92 00 - Joint Sealants – EIFS and Windows

E. Section 07 62 00 - Sheet Metal Flashing and Trim

1.03 REFERENCES

A. All references shall be latest edition per the date of this specification.
   1. ASTM D16 - Standard Terminology Relating to Paint, Lacquer, and Related Products
   2. ASTM C661-85 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer
   3. ASTM D661-93 - Standard Test Method of Evaluating Degree of Checking of Exterior Paints
   4. ASTM D662-93 - Standard Test Method of Evaluation Degree of Erosion of Exterior Paints
   5. ASTM D714-87 - Standard Test Method of Evaluating Degree of Blistering of Exterior Paints
   6. ASTM D4214-89 - Standard Test Method of Evaluating Degree of Chalking of Exterior Paints
   7. ASMT D2370-92 - Standard Test Methods for Tensile Properties of Organic Coatings
   8. ASMT 3359 - Standard Test Methods for Measuring Adhesion by Tape Test

1.04 SUBMITTALS

A. Submit under the provisions of Submit under the provisions of Section 01 30 00 and 00 72 13.

B. Product Data: Submit product data on products, including primers, solvents, cleaning compounds and other products not specified in the Section but used during the course of the work of this Section; include physical properties and application directions.

C. Submit a letter of approved applicator status from the manufacturer of the coating system.

D. Submit material safety data sheets (MSDS) for coating, primer and other materials with volatile dryers.

E. Submit copy of manufacturer’s warranty.

1.05 QUALITY ASSURANCE

A. Qualifications: Only prequalified contractors may perform this work. Same qualification requirements and pre-qualified list of contractors as for EIFS work. See Section 07 24 01 Repairs to Existing Exterior Insulation and Finish System for contractor qualifications and list of pre-approved contractors.

B. Product Manufacture: Company specializing in manufacturing quality paint and finish products with ten (10) years experience.

C. Applicator: Specialty contractor with five (5) years experience in commercial painting, finishing and coatings and approved by the product manufacturer.

D. Mechanics: Only skilled workers thoroughly trained and experienced with the materials, equipment and methods required in the Section. Workers must be able to demonstrate required skill level for review and acceptance but the Architect/Engineer.
   1. Installers must demonstrate to the satisfaction of the Architect/Engineer their ability to apply elastomeric coating in a manner consistent with placing the required product in place.
   2. Substitute installers brought in to perform the Work after the initial demonstration must also demonstrate to the Architect/Engineer their ability to apply elastomeric coating in a manner consistent with placing the required product in place.

E. Each installer shall receive and read a copy of this and related Sections prior to performing the work on this Project.

F. Tests: Architect/Engineer shall test coatings with wet film gauges, tape test ASTM D3359-A, and by removing or having samples removed and measured with calipers. The Contractor shall make staging regularly available to the Architect/Engineer for the purposes of inspection and testing. The Contractor shall remove samples as directed, and repair test locations in accordance with these Specifications.

1.06 REGULATORY REQUIREMENTS

A. Conform to state and local codes for flame/fuel/smoke rating requirements for finishes.

B. Comply with Volatile Organic Content (V.O.C.) regulation in the State of California.

1.07 PRE-INSTALLATION CONFERENCE

A. Convene a pre-installation conference one week prior to commencing work of this Section under provisions of Section 01 30 00.

B. Review application procedures and coordination required with related work.

1.08 MOCK-UPS

A. At locations chosen by the Architect/Engineer, install field samples as directed to include; one spandrel panel, two floors of column clad, and one panel at roof parapet (outside face) to be completed with the elastomeric coating system. The mock-up is to illustrate coats, color, texture, and finish.

B. The field samples shall include staggered and overlapping coats of the primer and the elastomeric coating, with substrate and portion of each coat visible. Apply in multiple coats necessary to achieve the specified thickness, tinting each coat differently. The coats shall be tinted with sufficient contrast to be visibly different during examination of cross section of sample cuts.

C. Written acceptance of the field sample by the Architect/Engineer shall be required before commencement of the Work. Work begun before acceptance of the sample shall not remain as part of the Work of this Section.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle products on site under provisions of Section 01 60 00.

B. Deliver products to site in sealed and labeled containers; inspect to verify acceptance.

C. Container labeling to include manufacturer’s name, type of coating, brand name, brand code, coverage, surface preparation, drying time, cleanup, color designation, and instructions for mixing and reducing.

D. Store coating material at minimum ambient temperature of 40 °F and a maximum of 90 °F, in well ventilated area, unless required otherwise by manufacturer’s instructions.

E. Take precautionary measures to prevent fire hazards and spontaneous combustion.

F. Store products in weather protected environment clear of the ground or roof deck.

G. Employ necessary means to protect the materials before, during and after installation. Immediately replace damaged materials and repair damaged work.

1.10 ENVIRONMENTAL REQUIREMENTS

A. Do not apply at surface temperatures below 40 °F or above 100 °F, nor during or 24 hours preceding inclement weather; including rain, fog, mist or freezing temperatures.

B. Do not apply exterior coatings during rain, or when relative humidity is within 5 degrees of the dew point as determined with a psychrometer, unless required otherwise by manufacture's instructions.

C. After the application of the primer and the coating, the temperature shall remain so for at least 24 hours thereafter or longer if necessary for the material to be sufficiently dried.

1.11 PROTECTION REQUIREMENTS

A. Protect exterior doors, windows and other exterior fixtures during water rinsing or with other cleaning methods utilized to prepare EIFS cleaner.

B. Prior to coating, areas not scheduled to receive coating shall be thorough masked off. Masking shall be removed upon completion of coating work. Protect elements surrounding the work of the Section from damage or disfiguration. Furnish drop cloths, shields and protective methods to prevent spray or drippings from disfiguring other surfaces and properties or damaging landscaping surrounding the work of this Section.

C. Repair damage to other surfaces caused by work of this Section.

D. Project area and site drains from debris during the Work.

1.12 WARRANTY

A. Dryvit Systems, Inc. / Tremco CPG shall offer a single source limited material defect and labor to repair or replace defective material warranty stating the Products will be free from manufacturing defect and will perform as warranted in the manner specified for the stated term measured from the Date of Project Substantial Completion.
   1. Products shall include Elastomeric Coatings, new exterior EIFS in Section 07 24 00, and Joint Sealant in Section 07 90 00 materials.
   2. Warranty term for Elastomeric Coatings shall be 10-years.
   3. A pre-construction meeting, including representatives of the Manufacturer, the Applicator / Installer, the Owner, and the Consultant (if applicable), shall be required prior to installation of the Products.
   4. Elastomeric Coating will be UV fade resistant for 10 years, except for specially produced colors.
      a. Specially produced colors will be UV fade resistant for 5 years when high-performance colorants are used to formulate.

B. The installer shall warrant workmanship separately. Dryvit / TremcoCPG shall not be responsible for workmanship associated with installation of the Outsulation System.

1.13 MAINTENANCE

A. Extra Materials: Provide four (4) five-gallon containers of each color and surface texture to Owner's Representative. Label each container with color, texture, and locations in addition to the manufacturer's label.

PART 2 PRODUCTS

2.01 SYSTEM DESCRIPTION

A. 100% acrylic based coating utilizing an elastomeric binder achieving (15-18 mils) Dry Film Thickness (DFT).

2.02 MATERIALS

A. Elastomeric Coating: A non textured, 100% acrylic based elastomeric coating:
   1. Coating No. 1: Weatherlastic Smooth by Dryvit Systems, Inc.
   2. Coating No. 2: HDP Water-Repellant Coating by Dryvit Systems, Inc.

B. Primer: A pigmented acrylic emulsion primer: Weatherprime Acrylic Primer by Dryvit Systems, Inc.

C. Patching Compound: Smooth, flexible, elastomeric patching compound: DAP Elastopatch.

D. Paint thinners and other materials not specifically indicated but required to achieve the finishes specified, of commercial quality acceptable to the manufacturer of the coating system.

E. Cleaners:
   1. Mildew Cleaner: To clean existing EIFS of mildew staining. Solution of warm water, bleach, and trisodium phosphate (TSP). Solution mix as specified in Dryvit Systems, Inc. DS152.
   2. Soil and Dirt Cleaner: For use on soiled existing EIFS, Sure Klean 600 as manufactured by Prosoco.
   3. Rust Cleaner: Sure Klean Ferrous Stain Remover as manufactured by Prosoco.

F. Sealant for Cracks Greater than 1/16 inch in Width: One part polyurethane; DAP Elastopatch.

G. Water: Clean potable water for rinsing.

PART 3 EXECUTION

3.01 GENERAL

A. Apply materials in strict accordance with the manufacturer's application directions and the requirements of these specifications. In case of conflict, the strictest requirements as determined by the Architect/Engineer shall be followed.

B. Notify the Architect/Engineer and manufacturer's representative of observed conditions that indicate the installed material does not confirm to the manufacturer's product information for qualities, adhesion and other performance characteristics.

C. Apply each coat in a uniform finish. Coatings shall be free of pinhole, voids, bubbles, holidays and other defects. Brush out defects immediately or the material shall be removed and the area recoated.

D. Pinholes evident in any coat of test samples shall provide basis for additional coats of material regardless of measurable DFT.

E. Apply each coat in a noticeably different darkness (not hue) than the preceding coat as approved by the Architect/Engineer.

F. Allow each coat to fully dry before applying successive coats. The Contractor shall verify the preceding coat to be free of defects before proceeding.

G. Film thickness for coating materials shall be strictly adhered to. When thicknesses are found to be less than those specified herein, additional coats at areas determined by Consultant shall be applied as necessary to achieve required DFT.

H. At locations where elastomeric wall coating joins with other coating materials or sealant, the elastomeric coating shall overlay the adjoining material, except where the edge may buck water or as indicated on drawings or where silicone sealant is used.

3.02 EXAMINATION

A. Prior to application, verify that surfaces are dry and free of defects that may be detrimental for the proper application of the coating material.

B. Verify that EFIS repairs have been completed and that repaired areas are fully cured.

C. Report to the Architect/Engineer conditions that are not in conformance with the manufacturer's requirements for application. Commencement of application indicates acceptance of conditions.

D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of cement plaster surfaces is below 12 percent.

E. Coordinate work.

3.03 PREPARATION

A. Protection:
   1. Mask to protect windows and doors including glass and frames against damage by cleaning solutions.
   2. Protect surfaces and landscaping from damage by work under this Section.
   3. Protect surfaces not scheduled for coating and adjacent properties from work under this Section.
   4. Remove all loose, deteriorated and peeling existing paint.

B. Cleaning:
   1. Prior to priming application, spray cleaners onto existing EFIS surfaces to remove mildew and dirt.
   2. Mix and apply SureKlean 600 in strict accordance with the manufacturer's published instructions. Allow cleaner to dwell on surfaces as necessary to have desired effect.
   3. Use soft bristle brush to lightly agitate cleaner to aid in removal of stains and dirt. Do not use hard scrubbing action or hard bristle brush to avoid damage to finish.
   4. Spot apply rust cleaner on areas where tie wire stains are visible and around railing penetrations, as necessary.
   5. Use the lowest pressures necessary to rinse cleaners and remove chalk and dirt from existing surface. Do not damage adjacent finished sealant work. Pressures shall not disturb existing surface. If necessary, scrub repair areas with brushes to remove residues.

C. Repair cracks in strict accordance with Dryvit published instructions for crack repairs.

D. The substrate preparation shall be approved by Dryvit prior to proceeding with installation of primer.

3.04 MIXING

A. Weatherlastic Smooth or HDP Water-Repellent coating and Weatherprime shall be mixed thoroughly to a uniform homogeneous consistency using a GoldblattJiffler mixer No. 15311H7 powered by a ½" drill (400-500 RPM) or equivalent.

3.05 PRIMER APPLICATION

A. Brush Grade Weatherprach shall be applied using nylon brush to the thickness required to correct imperfections in the EIFS surface. Consult with Architect/Engineer prior to the use of Weatherpatch material. Use of patching compound without prior authorization will result in rejection of work.

B. Apply primer to EIFS surfaces to provide a minimum of 2 dry mils of coverage.

C. Apply primer using ¾" nap polyester or polyester blend with nylon or lamb's wool, beveled ends, phenolic core, 18" wide roller frame with 2¼" inside diameter roller.

D. Apply in a continuous application, maintaining a wet edge, to a natural break.

E. Apply in even, parallel passes and overlap each pass 50% to avoid holidays, bare areas and to coat pinholes thoroughly. If required, follow with application at right angles to the first pass.

3.06 COATING APPLICATION

A. Brush application only cutting in and molding. Use nylon bristle brush.

B. For wall surfaces use minimum 10" wide roller cover with 1¼" - 1½" nap.

C. Completely saturate the roller cover and keep the roller loaded with coating to avoid foaming. Do not dry-roll or over-roll as this will cause excessive entrapment of air within the coating.

D. Elastomeric coating shall be applied in multiple coats (minimum two coats) to achieve a minimum of 15-18 mils DFT, excluding primer.

E. Apply in even, parallel passes and overlap each pass 50% to avoid holidays, bare areas and pinholes. If required, follow with an application at right angles to the first pass.

3.07 FIELD QUALITY CONTROL

A. Each worker is to process a wet film thickness gauge and regularly check film thickness during application. Rates of application are not proof of film thickness.

B. The Contractor is to take a minimum of 3 cut samples each day for testing DFT. The Consultant shall take additional samples. Test cut areas shall be repaired as part of the work included in this Section. Additional samples, taken if deficient DFT is found, and necessary to determine area for corrective work shall also be repaired as part of the work included in this Section.

3.08 CLEANING

A. As work proceeds, promptly remove coating where spilled, splashed, or splattered.

B. During progress of Work maintain premises free of unnecessary accumulation of tools, equipment, surplus materials, and debris.

C. Collect cotton waste cloths and materials which may constitute a fire hazard. Place in closed metal containers and remove daily from site.

END OF SECTION 07 11 00

SECTION 07 14 00
LIQUID-APPLIED ROOF COATING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Polyurethane elastomeric coating system for roller application on concrete decks.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00: Cast-In-Place Concrete.

B. Section 07 60 00: Flashing and Sheet Metal.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Submit manufacturer's standard submittal package including specification, installation instructions, and general information for each waterproofing material.

C. Applicator Qualifications: Submit current "Qualified Applicator" Certificate from the specified waterproofing manufacturer.

1.04 QUALIFICATIONS

A. Single Manufacturer: Primary waterproofing materials shall be products of a single manufacturer. The primary manufacturer shall recommend secondary materials. The primary manufacturer shall have a minimum of 10 years experience in the manufacture of materials of this type.

B. Applicators shall have a minimum of 5 years experience in the application of waterproofing materials of the type specified. Applicator shall possess a current "Qualified Applicator" Certificate from the specified waterproofing manufacturer.

C. Pre-Bid Conference: 10 working days prior to bid opening there is to be a mandatory Pre-Bid Conference. Anyone not attending the Pre-Bid Conference will not be allowed to bid the project. All products considered an equal to the specified product or any changes in the scope of work installation or specifications must be presented at the Pre-Bid Conference. If a change in the specifications is accepted, it will be considered as an alternate and will be presented as a bid amendment issued 5 working days prior to the bid opening. No other changes to specification or bid documents will be accepted.

D. Materials other than those specified shall be submitted to the architect/owner for approval no later than ten days prior to the bid date. In requesting prior approval, it shall be necessary to submit:

1. A letter of certification, signed by an officer of the manufacturer, stating that the alternative material is equal to or
2. Independent laboratory test data giving physical property values in comparison to the specified material.

E. Pre-Installation Conference: Just prior to commencement of the fluid application waterproofing system, meet at the site with a representative of the coating manufacturer, waterproofing contractor, general contractor, architect and other parties affected by this section. Review the application methods and procedures, substrate conditions, scheduling and safety.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least five years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. See Section 01 74 19 - Construction Waste Management and Disposal for packaging waste requirements.

B. Store all coating materials in the original unopened containers at 50 to 80 ?F (10 to 27 °C) till coating is ready for use.

C. B. Follow the special handling or storage requirements of the manufacturer for cold weather, hot weather, etc.

D. C. Safety: Refer to all applicable data, including, but not limited to MSDS, PDS, product labels, specific instructions for specific personal protection requirements.

E. D. Ventilation: Provide adequate ventilation to prevent the accumulation of hazardous fumes during application.

F. E. Environmental requirements: Proceed with work of this section only when existing and forecasted weather conditions will permit the application to be performed in accordance with the manufacturer’s recommendations.

1.07 FIELD CONDITIONS

A. Safety: Refer to all applicable data, including, but not limited to SDS, PDS, product labels and specific instructions for specific personal protection requirements.

B. Ventilation: Provide adequate ventilation to prevent the accumulation of hazardous fumes during application.

C. Weather: Proceed with the work of this section only when existing and forecasted weat

1.08 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Manufacturer's standard warranty.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Gaco: www.gaco.com.

B. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 MATERIALS

A. Sealer: GacoFlex E-5691 Three-Component Epoxy Primer Sealer.

B. Primer: GacoFlex E-5320 Two-Component Epoxy Concrete Primer (only if alternative E-5990 Sealer is used).

C. Polyurethane Base Coating: GacoFlex UB-64 Polyurethane Series Two-Component Coating.

D. Polyurethane Top Coating: GacoFlex U-66 Polyurethane Series Two-Component Coating.

E. Flashing and Joint Reinforcing Fabric: Gaco 66B and 66S Polyester Tape. GacoFlex NF-621 Neoprene Sheet Flashing and related materials as required for flashing drains, base angles, etc.

F. Granule: GacoShell Granule, a hard (90 Rockwell Scale) non-crushable, non-extractable organic granule with a specific gravity of 1.3 Size 18/ 40 unless otherwise specified.

G. Misc. Accessories: All items incorporated into this system shall be compatible with and approved by the coating manufacturer.

H. Allow additional material for rough or irregular surfaces. Consult Gaco Technical Service for further inquiries.

I. Silocone walkway system:Gaco SF-2036 Walkpad.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify substrate is ready to receive work; surface is clean, dry and free of substances that could affect bond.

B. Verify that the plywood shall conform to U.S. DOC PS 1 or CSA 0325 and shall carry the grade trademark of the Engineered Wood Association - APA AB EXT or APA AC EXT are acceptable. Underlayment grade plywood (APA AC EXT Underlayment) with solid, plugged cross bands under the face veneer is recommended for commercial installations. Refer to Gaco General Instruction GW-2-3 for complete information on the installation and fastening of plywood.
   1. Unacceptable Grades: APA C-D EXT, APA C-C EXT, Exposure 1 markings, oriented strand board (OSB), waferboard and Lauan or Mahogany plywood are NOT suitable substrates for liquid-applied coating systems. This is due to poor dimensional stability, weak glue lines which allow buckling or lifting of the top ply, and excessive splintered, leafed and raised surface grain.

C. Do not begin the work until the concrete substrate has cured 28 days and/or has achieved a moisture content of no greater than 6.8%.

D. Prior to application of waterproofing perform calcium chloride test, to verify a moisture content of 6.8% or less has been established.

E. Verify that the concrete meets the requirements of the coating manufacturer. Refer to Gaco General Instruction GW-2-1 for complete information on the installation and finishing of concrete.

F. Verify with architect, general contractor and manufacture that substrate conditions are acceptable to receive waterproofing application.

3.02 PREPARATION

A. Clean substrate to remove all surface contaminants. Refer to Gaco General Instructions GW-1-1, Surface Preparation.

B. Mask off all adjoining areas that are not to receive the fluid applied waterproofing.

C. Provide a suitable workstation to mix the coating materials.

3.03 INSTALLATION

A. Install in accordance with manufacturer's written instructions.

B. Technical Advice: The installation of this waterproofing membrane shall be accomplished in the presence of, or with the advice of the manufacturer’s technical representative. Contact the nearest regional office for assistance.

C. Concrete Sealer: Seal entire deck surface and all vertical or sloping surfaces of curbs, cants, parapets, etc., to receive coatings with one coat GacoFlex E-5691 Primer Sealer at a rate of one gallon per 200 ft² (3.78 L / 18.6 m²). Allow to dry until nearly tack free where water has evaporated leaving a clear film before proceeding to next coat. Recoat window is approximately 2 hours (depending on temperature and humidity) to 28 days. No additional primer is necessary when sealing with GacoFlex E-5691 Primer Sealer.
   1. Alternative Concrete Sealer: For areas vulnerable to a high vapor drive seal with GacoFlex E-5990 100% Solids Two-Component Epoxy Sealer. Use a squeegee to uniformly apply product over coverage area at a rate of one gallon per 150 ft² for CSP 3 190 ft² for CSP 2. Any excess product should be back rolled over entire area to ensure even application. Do not apply product if substrate is below 50 °F (10 °C) or above 110 °F (43 °C).

D. Concrete Primer: Only if alternative GacoFlex E-5990 Sealer is used, apply one coat of GacoFlex E-5320 Primer by roller at the rate of 1 gallon per 200 ft² (3.78 L / 23.2 m²). Allow 3 to 24 hours drying time. For maximum solvent resistance, see drying time directed in Gaco General Instructions GW-2-2, Priming. Drying times vary depending on weather conditions such

as temperature, humidity and air movement.

E. Metal Primer: Apply one coat of GacoFlex E-5320 Primer by roller at the rate of 1 gallon per 250 ft² (3.78 L/23.2 m²). Allow 3 to 24 hours drying time.
   1. NOTE: No primer required on new, clean and dry plywood.

F. Taping: Apply GacoFlex UB-64 Polyurethane base coat or U-66 Polyurethane by brush or roller in a 5" to 6" (127 mm to 152 mm) wide stripe coat centered over all joints, cracks and changes of plane to be taped. While this coat is still tacky, unroll GacoFlex 66B Tape into the coating and apply a top coat of GacoFlex Polyurethane over the GacoFlex 66B Tape smoothing out wrinkles and fishmouths.
   1. NOTE: Allow curing a minimum of 1½ hour before proceeding to next step. On plywood substrates, taping application will require approximately ½ gallon per 100 ft² (1.25 to 1.89 L / 9.3 m².) of polyurethane coating.

G. Polyurethane Base Coat: Apply one coat of GacoFlex UB-64 Polyurethane base coat or GacoFlex U-66 Polyurethane Series at a rate of 1.25 gallons per 100 ft² (4.73 L / 9.3 m²), (15 dry mils) to all areas to receive fluid applied waterproofing, including areas previously caulked, flashed or fabric reinforced.
   1. NOTE: Allow the base coat to cure completely: 8 hours minimum at 70 °F (21 °C)

H. Intermediate Coat and Texture: Apply GacoFlex UB-64 Polyurethane Base Coat or GacoFlex U-66 Polyurethane Series by roller to secure a minimum coverage of 1 gallon per 100 ft² (3.78 L / 9.3 m²) (12 dry mils). While coating is still wet, broadcast GacoShell 18/40 granule at approximately 6 to 8 lb per 100 ft² (2.7 kg to 3.6 kg / 9.3 m²) 1 gallon (3.78 L) dry volume.
   1. NOTE: Coat and sprinkle small areas at a time, taking care not to overlap coating and granule at edges. When texture coat is cured enough to walk on, lightly sweep away loose GacoShell granule. If GacoShell gets wet from rain allow 2 days of drying weather before proceeding with finish coat.

I. Finish Coat: Apply one coat of GacoFlex U-66 Polyurethane by roller in a coat of the desired color over the granule at the minimum rate of 1 gallon per 100 ft² (3.78 L / 9.3 m²). The GacoShell granule must be totally encapsulated by this finish coat. (12 dry mils).

J. Optional Topcoat: After finish coat has cured a minimum of 24 hours, apply GacoFlex UA-60 Aliphatic Polyurethane topcoat by roller at a minimum rate of ½ gallon per 100 ft² (1.89 L / 9.3 m²).
   1. NOTE: Allow 48 hours before deck is put into use. In cool temperatures, a longer curing time may be required.

K. Walk pads: per manufacturers' installation instructions.
   1. Location: Where indicated on drawings.

3.04 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements for additional requirements.

B. The contractor shall maintain a quality control program specifically to verify compliance with this specification. A daily log shall be kept to record progress in the field.

C. Inspections: A minimum of three (Substrate, Application and Final) Inspections, by an approved manufacturer’s representative, will be required on all projects requiring a warranty.

D. Thickness: Minimum over all dry film thickness of the completed fluid applied waterproofing, excluding GacoShell, will average 39 mils (.99 mm). Thickness including GacoShell will average approximately 45 mils. The optional topcoat will add approximately 5 mils of polyurethane coating to the system.

3.05 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals for additional submittals.

END OF SECTION 07 14 00

SECTION 07 21 00
THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Batt insulation and vapor retarder in exterior ceiling construction.

B. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

1.02 RELATED REQUIREMENTS

A. Section 07 25 00 - Weather Barriers: Separate air barrier and vapor retarder materials.

1.03 REFERENCE STANDARDS

A. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method 2017.

B. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing 2017.

C. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750°C 2019a.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

1.05 FIELD CONDITIONS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.01 APPLICATIONS

A. Insulation Under Concrete Slabs: themal batt insulation.

B. Insulation Above Lay-In Acoustical Ceilings: see Section 09 51 00.

2.02 BATT INSULATION MATERIALS

A. Glass Fiber Batt Insulation: Flexible preformed batt or blanket, complying with ASTM C665; friction fit.
   1. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.
   2. Formaldehyde Content: Zero.
   3. Thermal Resistance: R-value of 30.
   4. Facing: Aluminum foil, flame spread 25 rated; one side.
   5. Products:
      a. CertainTeed Corporation: www.certainteed.com/#sle.
      b. Johns Manville: www.jm.com/#sle.
      c. Owens Corning Corporation; EcoTouch PINK FIBERGLAS Insulation: www.ocbuildingspec.com/#sle.
      d. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 ACCESSORIES

A. Tape: Reinforced polyethylene film with acrylic pressure sensitive adhesive.
   1. Application: Sealing of interior circular penetrations, such as pipes or cables.
   2. Width: Are required for application.

B. Insulation Fasteners: Lengths of unfinished, 13 gauge, 0.072 inch high carbon spring steel with chisel or mitered tips, held in place by tension, length to suit insulation thickness and substrate, capable of securely supporting insulation in place.

C. Wire Mesh: Galvanized steel, hexagonal wire mesh.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.

B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.02 BATT INSTALLATION

A. Install insulation in accordance with manufacturer's instructions.

B. Install in exterior wall and roof spaces without gaps or voids. Do not compress insulation.

C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

3.03 PROTECTION

A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION 07 21 00

SECTION 07 24 00
REPAIRS TO EXISTING EXTERIOR INSULATION AND FINISH SYSTEM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Provide all labor, materials, tools, equipment, transportation, and services necessary for, or incidental to the execution of the exterior insulation and finish system work as shown on the Drawings, specified herein, and as directed by the Architect/Engineer in the field. Work shall include but not be limited to the following:

B. Base bid includes:
   1. Localized patching and repair of EIFS and substrates as described in this section and identified in the field by the Architect. Includes up to 24 locations and a total of 200 sf.
   2. EIFS Coating No. 2 on all existing and new EIFS surfaces.
   3. See also Section 01 23 00 - Alternates.

C. Alternate bid includes:
   1. All other work described in this section and on the plans.
   2. Repairs on joints and edges of all existing EIFS as required for sealant replacement.
   3. EIFS Coating No. 1 on all existing and new EIFS surfaces, in lieu of EIFS Coating No. 2.
   4. See also Section 01 23 00 - Alternates.

1.02 RELATED SECTIONS

A. Section 01 22 00 – Unit Prices

B. Section 01 23 00 - Alternates

C. Section 07 11 00 - Elastomeric Wall Coating

D. Section 07 90 00 - Joint Sealants - EIFS and Windows

E. Section 07 62 00 - Sheet Metal Flashing and Trim

1.03 REFERENCE

A. Abrasion Resistance: ASTM D968

B. Accelerated Weathering: ASTM G23

C. Mildew Distance: Mil Standard 810B

D. Moisture Resistance: ASTM D2247

E. Salty Spray Resistance: ASTM DB117

F. Air Leakage: ASMT E283

G. Water Penetration: ASTM E331

H. Drainage: ASTM E331

I. Water Vapor Transmission: ASTM E96 Procedure B

J. Surface Burning Characteristics: ASTM E84

K. ASTM E108 (Modified) Full Scale Fire Test; passed

L. ASTM E 119 One-Hour Assembly

M. UBC 26-4 (Formerly UBC 17-6)

N. BOCA National Building Code Radiant Heat Exposure Test of Exterior Wall Assemblies; passed

1.04 SYSTEM DESCRIPTION

A. The existing Exterior Insulation and Finish System (EIFS), consisting of a barrier type system with cementitious or non-cementitious base coat and acrylic finish coat. Repairs to the system shall be made with similar components.

1. Design Requirements:
   a. Acceptable substrates shall include:
      1) Exterior fiber reinforced cement or calcium silicate boards.
2. Deflection of the substrate system shall not exceed 1/240 times the span.
3. The substrate shall be flat within 6.4 mm (¼") in a 1.2 m (4') radius.
4. The slope of incline surfaces shall not be less than 6:12 and the length shall not exceed 305 mm (12").

1.05 SUBMITTALS

A. Submit under the provisions of Section 01 30 00 and 00 72 13.

B. Product Data: The Contractor shall submit to the Owner/Architect the Manufacturer's product data describing the products which will be used on the project.

C. Shop Drawings for Panelized Construction: The Panel Fabricator shall prepare and submit to the Owner/Architect complete drawings showing; wall layout, connections, details, expansion joints, and installation sequence.

D. Samples: The Contractor shall submit to the Owner/Architect two (2) samples of the Outsulation Plus System for each finish, texture and color to be used on the project. Samples shall be sufficient in size to accurately represent each color and texture being utilized on the project.

E. Test Reports: Contractor shall submit to the Architect copies of selected test reports verifying the performance of the Outsulation Plus System.

1.06 QUALITY ASSURANCE

A. Qualifications:
   1. Material shall be manufactured at a facility covered by the current ISO 9001 certification. Certification of the facility shall be done by a registrar accredited by the American National Standards Institute, Registrar Accreditation Board (ANSI-RAB).
   2. Insulation Board Manufacturer: Shall be licensed by Dryvit Systems, Inc., shall be capable of producing the Expanded Polystyrene (EPS) in accordance with the current Dryvit specification for Insulation Board, DS131, and shall subscribe to the Dryvit Thrid Party Certification and Quality Control Program.
   3. Contractor qualifications: Shall be knowledgeable in the proper installation of the Dryvit Outsulation Plus system and shall be experienced and competent in the installation of Exterior Insulation and Finish Systems. Additionally, the Contractor shall posses a current Outsulation Plus System Trained Contractor Certificate ** issued by Dryvit Systems, Inc. and/or possess a DryvitCARE applicator listing with Dryvit Systems, Inc. Following are DryvitCARE contractors pre-approved for use on this project:

Alpha Restoration & Waterproofing Emile Kishek218 Littlefield Ave.S. San Francisco, CA 94080650-875-7500415-716-3487 Cemile@alpharestoration.com	CAWC Waterproofing & Restoration Ron Mayer or Brennan Mayer1177 7th Ave.San Mateo, CA 94402650-722-1019 O650-722-3490 Ron cellroy@cawcwaterproofing.com 650-347-1404 Brennan cellbrennan@cawcwaterproofing.com
Everest Waterproofing & Restoration Peter Vorhees1270 Missouri StreetSan Francisco, CA 94107415-282-9800 O415-517-4130 Cpvorhees@everestsf.com	Urban Waterproofing Inc Jeff Lewis40 Lisbon StreetSan Rafael, CA 94901415-485-1134 O415-302-6065 CJeff.Lewis@Urbanco.Com
Rainbow Waterproofing & Restoration Chris Abell600 Treat Ave.San Francisco, CA 94110415-641-1578 O415-987-4095 Cchris@rainbow415.com	

B. Pre-Installation Conference
   1. Contractor shall coordinate a pre-installation conference with the Architect, the installer of the EIFS and the manufacturer's representative.
   2. The meeting shall be set two (2) weeks prior to the start of work under this Section and after formal submittal has been made under Section 1.3 of this specification.
   3. Notify Architect in writing with a seven (7) day advanced notice.
   4. Coordinate regular site visits with manufacturer's representative to inspect different stages of the work. Notify Architect with meeting schedule with a three (3) day advanced notice.
   5. Obtain written reports from manufacturer's representative following each site visit and forward to the Architect.

C. Mock-Ups:
   1. The Contractor shall, before the project commences, provide the Owner/Architect with mock-ups for approval.
   2. The mock-ups shall be of suitable size as required to accurately represent each repair condition, texture, finish, and color to be utilized on the project.
   3. The mock-ups shall be prepared with the same products, tools, equipment, and techniques required for the actual applications.
   4. Mock-ups shall represent conditions at EIFS/EIFS joints, field of the wall (if any), around windows, and penetrations.
   5. Mock-ups shall be perform by the same workers designated to perform work on the project.
   6. The finish used shall be from the same batch as that being used for the project.
   7. Coordinate mock-ups under the Section with mock-ups required under Sections 07 90 00 Sealant – EIFS and Windows and 07 62 00 Sheet Metal and Trim.
   8. Mock-ups shall be approved in writing by the manufacturer of the EIFS system.
   9. The approved mock-up shall remain as reference for approved texture and finish.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Packing, Shipping, Handling, and Unloading: All materials shall be delivered to the job site in the original, unopened packages with labels intact. Questionable materials shall not be used.

B. Storage: Minimum storage temperature shall be 7 °C (45 °F) for Demandit, Revyvit and Color Prime; 10 °C (50 °F) for Ameristone and 4 °C (40 °F) for other wet products.

C. Protection: Protect all products from weather and direct sunlight.

1.08 PROJECT CONDITIONS

A. Application of wet materials shall not take place during inclement weather unless appropriate protection is provided. Protect materials for inclement weather until they are completely dry.

B. Application of wet materials shall be at a minimum ambient temperature of 4 °C (40 °F), 7 °C (45 °F) or 10 °C (50 °F) depending on the product and rising. These temperatures shall be maintained for a minimum of 24 hours (48 hours for Ameristone) thereafter, or until completely dry.

1.09 SEQUENCING AND SCHEDULING

A. Installation of the Dryvit Outsulation System shall be coordinated.

1.10 WARRANTY

A. Dryvit Systems, Inc. / Tremco CPG shall offer a single source limited material defect and labor to repair or replace defective material warranty stating the Products will be free from manufacturing defect and will perform as warranted in the manner specified for the stated term measured from the Date of Project Substantial Completion.
   1. Products shall include new exterior EIFS, Elastomeric Coatings in Section 07 11 00, and Joint Sealant in Section 07 90 00 materials.
   2. Warranty term for EIFS Repair materials shall be 10-years.

3. A pre-construction meeting, including representatives of the Manufacturer, the Installer, the Owner, and the Consultant (if applicable), shall be required prior to installation of the Products.
4. Textured Finish will be UV fade resistant for 10 years, except for specially produced colors.
    a. Specially produced colors will be UV fade resistant for 5 years when high-performance colorants are used to formulate.
5. The Existing EIF System shall be eligible to receive a renewal of the original system warranty if the owner satisfactorily completes the specific renovation requirements of the Platinum DryvitCARE warranty program as published by the EIFS Manufacturer.
    a. Renewal warranty program shall require the use of a Dryvit listed third party consultant for assessment, scope of work development, bidding coordination, installation verification and closeout validation.

B. The installer shall warrant workmanship separately. Dryvit shall not be responsible for workmanship associated with installation of the Outsulation System.

PART 2 PRODUCTS

2.01 SYSTEM/MANUFACTURERS

A. The Dryvit Outsulation System is an Exterior Insulation and Finish System (EIFS), consisting of an adhesive, expanded polystyrene insulation board, base coat, Dryvit reinforcing mesh and Dryvit finish.

2.02 MATERIALS

A. Adhesives/Base Coats: Used to adhere the insulation board to the air/weather barrier and to imbed the reinforcing mesh on the face of the insulation board, shall be one of the following:
    1. Genesis: A fiber-reinforced acrylic modified product, which is field mixed with Portland cement in a 1:1 ratio by weight.
    2. NCB: Non-cementitious factory mixed, fully formulated, water based product for use as base coat to match existing.
    3. Dryflex: A high percentage polymer-blend material which is field mixed with Portland cement in a 1:1 ratio by weight for use where called for on drawings.

B. Insulation Board: Expanded Polystyrene meeting the Dryvit Specification for Insulation Board, DS131 thickness to match existing (1½" in field of wall).

C. Dryvit Reinforcing Mesh: Shall be a balanced, open weave, glass fiber fabric treated for compatibility with other system materials.
    1. Standard Plus: For field application.
    2. Panzer 15: For use at base of walls, railing and other locations as indicated on drawings.
    3. Detail and Corner Mesh as recommended for use around windows, corners and penetrations.

D. Dryvit Finish: Shall be the type, color and texture as selected to match existing.
    1. Standard DPR (Dirt Pickup Resistance) Finishes: Water-based acrylic finishes with integral color and texture to match existing: Verify during mock-up.

E. Primers:
    1. Weatherprime: For use on base coat to receive sealant.
    2. Color Prime: For application under finish.

F. Patching Compound: Dryvit RapidPatch one-component, fast-setting, polymer-modified, fiber-reinforced, cement-based, non-sagging, patching material for Dryvit systems.

G. Miscellaneous Materials:
    1. Other materials necessary to complete proper installation in accordance with drawings and specifications and which are approved by the manufacturer of the EIFS.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that all sealant has been removed.

B. Verity that adjacent surfaces and objects are adequately protected.

C. Verify that damaged EIFS has been removed.

D. Coordinate inspection of Environmental Engineer prior to proceeding with repairs. Do not proceed until receiving written authorization from the Architect.

3.02 PREPARATION

A. Protect EIFS surfaces not scheduled for repair from damage during work under this Section.

B. The EIFS materials shall be protected by permanent or temporary means from weather and other damage prior to, during and following application until dry.

C. Protect adjoining work and property during EIFS installation.

D. The substrate shall be prepared as to be free of foreign materials such as oil, dust, dirt, form release agents, efflorescence, paint, water repellants, moisture, frost and any other condition that may inhibit adhesion.

E. At areas where damaged EIFS is removed, carefully grind 4” of finish coat at permitter of cut area to expose base coat for tie in.

F. Carefully grind finish coat to expose base coat on the side of the panel edges (at sealant bond line) at EIFS/EIFS joints and along all EIFS to aluminum frames.

G. Extend grinding on edges of face of panel a minimum ½” to facilitate monitoring of rebuilding of joints.

H. At penetrations where existing sealant is a bead (instead of a joint), grind finish coat to expose base coat a minimum 1½” on the face of the EIFS panel around penetrations.

3.03 INSTALLATION

A. The system shall be installed in accordance with the Dryvit Outsulation System Application Instructions, DS204.

B. Imbed mesh in new base coat to overlap existing base coat 4”.

C. The overall minimum base coat thickness shall be 1/16” with mesh fully embedded. Use the two (2) passes method to install base coat.

D. Pre wrap edges before placement of insulation panel or placement sections.

E. Apply primer prior to installation of finish in accordance with Dryvit recommendations. Allow primer to dry for two (2) days prior to installation of finish.

3.04 REPAIR OF BASE COAT AT SEALANT JOINTS

A. Perform repairs to damaged EIFS in strict accordance with Dryvit manual titled “Specific Recommendations For Repair The Outsulation System.”

B. In case of conflict between the drawings, this specification, and Dryvit’s manual, use the more restrictive requirements. Consult with Architect prior to implementation.

C. Rebuild all joints with NCB base coat as necessary to restore it.

D. The skim coat should only be applied at 1/16” minimum thickness required to restore the base coat and cover any exposed mesh.

E. Repair damaged mesh in strict accordance with manufacturer’s instructions.

F. Allow base coat to fully cure.

G. Inspect base coat repairs for imperfections that may show through the finish. Correct as necessary.

3.05 REPAIR AT SMALL AREAS OR IMPACT DAMAGE (PATCHING)

A. Perform repairs to damaged EIFS in strict accordance with Dryvit manual titled “DryvitCare EIFS Repair Procedures DS 498, Document DC002.”

B. Holes or other damage less than 3 inch x 3 inch (76 mm x 76 mm) in size can be easily repaired using Dryvit RapidPatch product. The product needs to be applied at a thickness of ¾ inch – 1 inch (19 mm – 25 mm) to allow proper heat generation for rapid cure. Under normal conditions, finish can be applied the same day.

C. With a sharp utility knife, cut through and remove the lamina, exposing a neat uniform-sized area of insulation slightly larger than the damaged area. Using a disk grinder or belt sander with a 20 grit aluminum oxide disk or belt, remove the finish around the cut, exposing the reinforced base coat approximately 3 inch (76 mm) around the damage area.

D. Cut out the loose, damaged foam to reveal fresh foam. Cutting off the foam all the way to substrate is not recommended. When foam in the damaged area is well bonded to the substrate, care must be taken to expose as little of the substrate as possible and prevent rupturing the surface of the substrate. The area to be patched should be round or rectangular in shape and between ¾ inch – 1 inch (19 mm – 25 mm) in depth. Deeper patches should be filled with a piece of EPS so the patch thickness is within this range. RapidPatch material may be used to adhere the EPS filler to the substrate.

E. Precisely mask the surrounding finish with masking tape.

F. Mix the RapidPatch and apply the mixture to the damaged area with a margin trowel to a depth of approximately ⅛ inch (3.2 mm) below the existing base coat surface. Also add a thin layer of material on the exposed base coat surrounding the patch. Cut a piece of Detail Mesh® to the proper size and place over the wet RapidPatch overlapping the existing base coat a minimum of 1 inch (25 mm). Add additional RapidPatch material to completely fill the damaged area, cover the mesh and feather onto the surrounding base coat. If the material appears initially loose, wait a short time until it stiffens up and level off any imperfections with additional RapidPatch mixture as needed.

G. When the patching material in the damaged area is stiff enough, use a clean, damp margin trowel to smooth out the surface. This may be repeated until a satisfactory surface is achieved. The trowel must be clean and damp prior to each smoothing.

H. Let RapidPatch set for at least 60 minutes, depending on ambient conditions.

I. If necessary, again, precisely mask the surrounding existing finish with masking tape.

J. Apply the new finish over the patched area and texture to match the surrounding finish. NOTE: Do not sand the patched area prior to finish application.

K. If the entire wall is to be refinished, it is not necessary to mask off and apply finish at this stage. Refer to the procedure for repairing texture variations for complete details. NOTE: Because RapidPatch is specifically designed to compensate for drying shrinkage, it may be used to repair damaged areas up to 3 inch x 3 inch x 1 inch (76 mm x 76 mm x 25 mm).

3.06 PRIMING AND SEALANT

A. Apply Weatherprime along EIFS edges to receive sealant and allow to dry for a minimum of 72 hours.

B. Install sealant in strict accordance with Section 07 90 00.

3.07 TEXTURE/FINISH COAT

A. Apply ColorPrime over repaired base coat and allow to cure.

B. Apply new finish to match surrounding areas.

C. Texture to match existing and approved mock-ups.

3.08 FIELD QUALITY CONTROL

A. The Contractor shall be responsible for the proper application of the Outsulation materials.

B. Dryvit assumes no responsibility for on-site inspections or application of its products.

3.09 CLEANING

A. All excess EIFS materials shall be removed from the job site by the Contractor in accordance with contract provisions and as required by applicable law.

B. All surrounding areas, where the EIFS was applied, shall be left free of debris and foreign substances resulting from the Contractor's work.

3.10 PROTECTION

A. EIFS shall be protected from weather and other damage until permanent protection in the form of flashings, sealant, etc. are installed.

END OF SECTION 07 24 00

This page intentionally left blank

SECTION 07 25 00
WEATHER BARRIERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water-Resistive Barrier: Under exterior wall cladding, over sheathing or other substrate; not air tight or vapor retardant.

B. Air Barriers: Materials that form a system to stop passage of air through exterior walls, joints between exterior walls and roof, and joints around frames of openings in exterior walls.

1.02 RELATED REQUIREMENTS

A. Section 05 40 00 - Cold-Formed Metal Framing: Water-resistive barrier under exterior cladding.

B. Section 07 21 00 - Thermal Insulation: Vapor retarder installed in conjunction with batt insulation.

C. Section 07 62 00 - Sheet Metal Flashing and Trim: Metal flashings installed in conjunction with weather barriers.

D. Section 07 92 00 - Joint Sealants: Sealing building expansion joints.

E. Section 09 21 16 - Gypsum Board Assemblies: Water-resistive barrier under exterior cladding.

1.03 DEFINITIONS

A. Weather Barrier: Assemblies that form either water-resistive barriers, air barriers, or vapor retarders.

B. Air Barrier: Air tight barrier made of material that is relatively air impermeable but water vapor permeable, both to the degree specified, with sealed seams and with sealed joints to adjacent surfaces. Note: For the purposes of this specification, vapor impermeable air barriers are classified as vapor retarders.

C. Water-Resistive Barrier: Water-shedding barrier made of material that is moisture resistant, to the degree specified, intended to be installed to shed water without sealed seams.

1.04 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency current edition.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2021a.

C. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials 2016.

D. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials 2021a.

E. ICC-ES AC38 - Acceptance Criteria for Water-Resistive Barriers 2016, with Editorial Revision (2019).

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on material characteristics.

PART 2 PRODUCTS

2.01 WEATHER BARRIER ASSEMBLIES

A. Water-Resistive Barrier: Provide on exterior walls under exterior cladding.
   1. Use building paper unless otherwise indicated.

B. Air Barrier:
   1. On outside surface of sheathing of exterior walls use air barrier sheet, mechanically fastened type.

2.02 WATER-RESISTIVE BARRIER MATERIALS (NEITHER AIR BARRIER OR VAPOR RETARDER)

A. Building Paper: Asphalt-saturated Kraft building paper complying with requirements of ICC-ES AC38 Grade D.

2.03 AIR BARRIER MATERIALS (WATER VAPOR PERMEABLE AND WATER-RESISTIVE)

A. Air Barrier Sheet, Mechanically Fastened:
   1. Air Permeance: 0.004 cfm/sq ft, maximum, when tested in accordance with ASTM E2178.
   2. Water Vapor Permeance: 5 perms, minimum, when tested in accordance with ASTM E96/E96M Procedure A (Desiccant Method) at 73.4 degrees F.
   3. Ultraviolet (UV) and Weathering Resistance: Approved in writing by manufacturer for up to 180 days of weather exposure.
   4. Surface Burning Characteristics: Flame spread index of 25 or less, and smoke developed index of 50 or less, when tested in accordance with ASTM E84.
   5. Seam and Perimeter Tape: Polyethylene self adhering type, mesh reinforced, 2 inches wide, compatible with sheet material; unless otherwise specified.

2.04 ACCESSORIES

A. Sealants, Tapes, and Accessories for Sealing Weather Barrier and Sealing Weather Barrier to Adjacent Substrates: As specified or as recommended by weather barrier manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and conditions are ready to accept the work of this section.

3.02 PREPARATION

A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

3.03 INSTALLATION

A. Install materials in accordance with manufacturer's instructions.

B. Water-Resistive Barriers: Install continuous barrier over surfaces indicated, with sheets lapped to shed water but with seams not sealed.

C. Air Barriers: Install continuous air tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.

D. Mechanically Fastened Sheets - On Exterior:
   1. Install sheets shingle-fashion to shed water, with seams generally horizontal.
   2. Overlap seams as recommended by manufacturer but at least 6 inches.
   3. Overlap at outside and inside corners as recommended by manufacturer but at least 12 inches.
   4. For applications specified to be air tight, seal seams, laps, penetrations, tears, and cuts with self-adhesive tape; use only large-headed, gasketed fasteners recommended by the manufacturer.
   5. Install water-resistive barrier over jamb flashings.
   6. Install air barrier and vapor retarder underneath the jamb flashings.
   7. Install head flashings under weather barrier.
   8. At openings to be filled with frames having nailing flanges, wrap excess sheet into opening; at head, seal sheet over flange and flashing.

E. Openings and Penetrations in Exterior Weather Barriers:
   1. Install flashing over sills, covering entire sill frame member, extending at least 5 inches onto weather barrier and at least 6 inches up jambs; mechanically fasten stretched edges.
   2. At openings to be filled with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with sealing tape at least 4 inches wide; do not seal sill flange.

3. At openings to be filled with non-flanged frames, seal weather barrier to each side of opening framing, using flashing at least 9 inches wide, covering entire depth of framing.
4. At head of openings, install flashing under weather barrier extending at least 2 inches beyond face of jambs; seal weather barrier to flashing.
5. At interior face of openings, seal gap between window/door frame and rough framing, using joint sealant over backer rod.
6. Service and Other Penetrations: Form flashing around penetrating item and seal to weather barrier surface.

3.04 PROTECTION

A. Do not leave materials exposed to weather longer than recommended by manufacturer.

B. Do not leave paper- or felt-based barriers exposed to weather for longer than one week.

END OF SECTION 07 25 00

This page intentionally left blank

SECTION 07 41 13
METAL ROOF PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Architectural roofing system of preformed steel panels at Fire Pump House.

1.02 RELATED REQUIREMENTS

A. Section 05 12 00 - Structural Steel Framing: Roof framing and purlins.

B. Section 07 92 00 - Joint Sealants: Sealing joints between metal roof panel system and adjacent construction.

1.03 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix) 2017a.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.

C. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength 2018a.

D. ASTM C1363 - Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus 2019.

E. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection 2020.

F. IAS AC472 - Accreditation Criteria for Inspection Programs for Manufacturers of Metal Building Systems 2018.

G. ICC-ES AC188 - Acceptance Criteria for Roof Underlayments 2012, with Editorial Revision (2015).

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Storage and handling requirements and recommendations.
   2. Installation methods.
   3. Specimen warranty.

C. Shop Drawings: Include layouts of roof panels, details of edge and penetration conditions, spacing and type of connections, flashings, underlayments, and special conditions.
   1. Show work to be field-fabricated or field-assembled.

D. Selection Samples: For each roofing system specified, submit color chips representing manufacturer's full range of available colors and patterns.

E. Manufacturer's qualification statement.

F. Test Reports: Indicate compliance of metal roofing system to specified requirements.

G. Warranty: Submit specified manufacturer's warranty and ensure that forms have been completed in City's name and are registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

1.06 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Finish Warranty: Provide manufacturer's special warranty covering failure of factory-applied exterior finish on metal roof panels and agreeing to repair or replace panels that show evidence of finish degradation, including significant fading, chalking, cracking, or peeling within specified warranty period of five years from Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Architectural Metal Roof Panels:
   1. Metal Sales; Magna-loc 90" www.metalsales.us.com.
   2. ATAS International, Inc; Field-Lok FLM: www.atas.com/#sle.
   3. Berridge Manufacturing Company; M-Panel: www.berridge.com/#sle.
   4. Drexel Metals Inc; 150SS Profile: www.drexmet.com/#sle.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

A. Metal Roof Panels: Provide complete roofing assemblies, including roof panels, clips, fasteners, connectors, and miscellaneous accessories, tested for compliance with the following minimum standards:
   1. Structural Design Criteria: Provide panel assemblies designed to safely support design loads at support spacing indicated, with deflection not to exceed L/180 of span length(L) when tested in accordance with ASTM E1592.
   2. Overall: Complete weathertight system tested and approved in accordance with ASTM E1592.
   3. Thermal Movement: Design system to accommodate without deformation anticipated thermal movement over ambient temperature range of 100 degrees F.

2.03 ARCHITECTURAL METAL ROOF PANELS

A. Architectural Metal Roof Panels: Provide complete engineered system complying with specified requirements and capable of remaining weathertight while withstanding anticipated movement of substrate and thermally induced movement of roofing system.

B. Architectural Metal Panels: Factory-formed panels with factory-applied finish.
   1. Steel Panels:
      a. Zinc-coated steel complying with ASTM A653/A653M; minimum G60 galvanizing.
      b. Steel Thickness: Minimum 24 gauge, 0.024 inch.
   2. Texture: Smooth.
   3. Length: Full length of roof slope, without lapped horizontal joints.
   4. Width: Maximum panel coverage of 24 inches.

2.04 ATTACHMENT SYSTEM

A. Concealed System: Provide manufacturer's standard stainless steel or nylon-coated aluminum concealed anchor clips designed for specific roofing system and engineered to meet performance requirements, including anticipated thermal movement.

2.05 SECONDARY FRAMING

A. Miscellaneous Secondary Framing: Light gauge steel framing incidental to structural supports; fabricated from steel sheet.

B. Secondary Framing for Roof Retrofit: Light gauge, asymmetrical section, steel zee profile framing precut with notches that match size, shape and spacing of existing metal roof seams.

C. Framing Material: ASTM A 1011/A 1011M, Designation SS steel sheet.
   1. Profile: Manufacturer's standard cee, zee, asymmetrical zee, hat channel, plain channel, single slope eave strut, double slope eave strut, and angle.
   2. Thickness: 12 gauge, 0.1046 inch.

3. Finish: Galvanized per ASTM A653/A653M, G90.

D. Framing Connectors: Factory-made formed steel sheet, ASTM A653/A653M SS Grade 50, with G60/Z180 hot dipped galvanized coating and factory punched holes.

2.06 FABRICATION

A. Panels: Provide factory or field fabricated panels with applied finish and accessory items, using manufacturer's standard processes as required to achieve specified appearance and performance requirements.

B. Joints: Provide captive gaskets, sealants, or separator strips at panel joints to ensure weathertight seals, eliminate metal-to-metal contact, and minimize noise from panel movements.

2.07 FINISHES

A. Fluoropolymer Coil Coating System: Polyvinylidene fluoride (PVDF) multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent PVDF resin, and at least 80 percent of coil coated aluminum surfaces having minimum total dry film thickness (DFT) of 0.9 mil, 0.0009 inch; color and gloss as selected by Architect from manufacturer’s standard line.

2.08 ACCESSORIES

A. Miscellaneous Sheet Metal Items: Provide flashings, gutters, downspouts, trim, moldings, closure strips, preformed crickets, caps, and equipment curbs of the same material, thickness, and finish as used for the roofing panels. Items completely concealed after installation may optionally be made of stainless steel.

B. Rib and Ridge Closures: Provide prefabricated, close-fitting components of steel with corrosion resistant finish or combination steel and closed-cell foam.

C. Sealants:
1. Exposed Sealant: Elastomeric; silicone, polyurethane, or silyl-terminated polyether/polyurethane.
2. Concealed Sealant: Non-curing butyl sealant or tape sealant.
3. Seam Sealant: Factory-applied, non-skinning, non-drying type.

D. Underlayment: Synthetic non-asphaltic sheet, intended by manufacturer for mechanically fastened roofing underlayment without sealed seams.
1. Type: Woven polypropylene with anti-slip polyolefin coating on both sides.
2. Minimum Requirements: Comply with requirements of ICC-ES AC188 for non-self-adhesive sheet.
3. Self Sealability: Passing nail sealability test specified in ASTM D1970/D1970M.
4. Low Temperature Flexibility: Passing test specified in ASTM D1970/D1970M.
5. Fasteners: As specified by manufacturer and building code qualification report or approval.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation of preformed metal roof panels until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Coordinate roofing work with provisions for roof drainage, flashing, trim, penetrations, and other adjoining work to assure that the completed roof will be free of leaks.

B. Separate dissimilar metals by applying a bituminous coating, self-adhering rubberized asphalt sheet, or other permanent method approved by roof panel manufacturer.

C. Where metal will be in contact with wood or other absorbent material subject to wetting, seal joints with sealing compound and apply one coat of heavy-bodied bituminous paint.

3.03 INSTALLATION

A. Overall: Install roofing system in accordance with approved shop drawings and panel manufacturer's instructions and recommendations, as applicable to specific project conditions. Anchor all components of roofing system securely in place while allowing for thermal and structural movement.
   1. Install roofing system with concealed clips and fasteners, except as otherwise recommended by manufacturer for specific circumstances.
   2. Minimize field cutting of panels. Where field cutting is absolutely required, use methods that will not distort panel profiles. Use of torches for field cutting is absolutely prohibited.

B. Accessories: Install all components required for a complete roofing assembly, including flashings, gutters, downspouts, trim, moldings, closure strips, preformed crickets, caps, equipment curbs, rib closures, ridge closures, and similar roof accessory items.

C. Roof Panels: Install panels in strict accordance with manufacturer's instructions, minimizing transverse joints except at junction with penetrations.
   1. Install sealant or sealant tape, as recommended by panel manufacturer, at end laps and side joints.

3.04 CLEANING

A. Clean exposed sheet metal work at completion of installation. Remove grease and oil films, excess joint sealer, handling marks, and debris from installation, leaving the work clean and unmarked, free from dents, creases, waves, scratch marks, or other damage to the finish.

3.05 PROTECTION

A. Do not permit storage of materials or roof traffic on installed roof panels. Provide temporary walkways or planks as necessary to avoid damage to completed work. Protect roofing until completion of project.

B. Touch-up, repair, or replace damaged roof panels or accessories before Date of Substantial Completion.

END OF SECTION 07 41 13

SECTION 07 62 00
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fabricated sheet metal items, including flashings, counterflashings, gutters, downspouts, exterior penetrations, and parapet copings.

B. Sealants for joints within sheet metal fabrications.

1.02 RELATED REQUIREMENTS

A. Section 07 24 00 - Repairs to Existing Exterior Insulation and Finish System: flashings associated with repair work.

B. Section 07 41 13 - Metal Roof Panels: Flashings associated with metal roof panels.

C. Section 07 71 23 - Manufactured Gutters and Downspouts.

D. Section 07 92 00 - Joint Sealants: Sealing non-lap joints between sheet metal fabrications and adjacent construction.

1.03 REFERENCE STANDARDS

A. ASTM C920 - Standard Specification for Elastomeric Joint Sealants 2018.

B. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free 2007 (Reapproved 2018).

C. CDA A4050 - Copper in Architecture - Handbook current edition.

D. SMACNA (ASMM) - Architectural Sheet Metal Manual 2012.

1.04 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

B. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Sheet Metal Flashing and Trim Manufacturers:
   1. Fairview Architectural LLC: www.fairview-na.com/#sle.
   2. OMG Roofing Products: www.omgroofing.com/#sle.
   3. Petersen Aluminum Corporation: www.pac-clad.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 SHEET MATERIALS

A. Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24 gauge, (0.0239 inch) thick base metal.

B. Pre-Finished Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24 gauge, (0.0239) inch thick base metal, shop pre-coated with PVDF coating.

C. Aluminum: ASTM B209 (ASTM B209M); 20 gauge, 0.032 inch thick; anodized finish of color as selected.
   1. Clear Anodized Finish: AAMA 611 AA-M12C22A41 Class I clear anodic coating not less than 0.7 mils thick.
   2. Color Anodized Finish: AAMA 611 AA-M12C22A42/44 Class I integrally or electrolytically colored anodic coating not less than 0.7 mils thick.

2.03 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Form pieces in longest possible lengths.

C. Hem exposed edges on underside 1/2 inch; miter and seam corners.

D. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

E. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.

F. Fabricate flashings to allow toe to extend 2 inches over roofing gravel. Return and brake edges.

2.04 GUTTER AND DOWNSPOUT FABRICATION

A. Gutters: SMACNA (ASMM) Rectangular profile.

B. Downspouts: Rectangular profile.

C. Gutters and Downspouts: Size for rainfall intensity determined by a storm occurrence of 1 in 10 years in accordance with SMACNA (ASMM).

D. Accessories: Profiled to suit gutters and downspouts.
   1. Anchorage Devices: In accordance with SMACNA (ASMM) requirements.
   2. Gutter Supports: Brackets.
   3. Downspout Supports: Brackets.

E. Seal metal joints.

2.05 ACCESSORIES

A. Fasteners: Galvanized steel, with soft neoprene washers.

B. Primer: Zinc chromate type.

C. Concealed Sealants: Non-curing butyl sealant.

D. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.

E. Plastic Cement: ASTM D4586/D4586M, Type I.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.

B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.

3.03 INSTALLATION

A. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted..

B. Apply plastic cement compound between metal flashings and felt flashings.

C. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.

D. Seal metal joints watertight.

E. Secure gutters and downspouts in place with concealed fasteners.

F. Slope gutters 1/4 inch per 10 feet, minimum.

END OF SECTION 07 62 00

This page intentionally left blank

SECTION 07 71 23
MANUFACTURED GUTTERS AND DOWNSPOUTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Galvanized steel gutters and downspouts.

1.02 RELATED REQUIREMENTS

A. Section 07 61 00 - Sheet Metal Roofing.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Comply with SMACNA (ASMM) for sizing components for rainfall intensity determined by a storm occurrence of 1 in 5 years.

PART 2 PRODUCTS

2.01 MANUFACTURERS

2.02 MATERIALS

A. Galvanized Steel Sheet: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 0.02 inch thick base metal.

2.03 COMPONENTS

A. Gutters: CDA square style profile.

2.04 FABRICATION

A. Form gutters and downspouts of profiles and size indicated.

B. Fabricate with required connection pieces.

C. Form sections square, true, and accurate in size, in maximum possible lengths, free of distortion or defects detrimental to appearance or performance. Allow for expansion at joints.

D. Hem exposed edges of metal.

E. Fabricate gutter and downspout accessories; seal watertight.

2.05 FINISHES

A. Fluoropolymer Coating: High Performance Organic Finish, AAMA 2604; multiple coat, thermally cured fluoropolymer finish system; color as indicated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that surfaces are ready to receive work.

3.02 PREPARATION

A. Paint concealed metal surfaces and surfaces in contact with dissimilar metals with protective backing paint to a minimum dry film thickness of 15 mil.

3.03 INSTALLATION

A. Install gutters, downspouts, and accessories in accordance with manufacturer's instructions.

B. Slope gutters 1/4 inch per foot .

END OF SECTION 07 71 23

This page intentionally left blank

SECTION 07 81 00
APPLIED FIRE PROTECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Applied fire protection of interior structural steel not exposed to damage or moisture. Applies to Building 1 and Buiding 2.

B. New structural steel: provide minimum 1-hour applied fire resistance as part of the basic scope of work at all new structural steel beams, columns, connectors, and appurtenances.

C. Existing structural steel: provide minimum 1-hour applied fire resistance as part of the basic scope of work at all existing unprotected structural steel beams, columns, connectors, appurtenances, and any metal decking that is unprotected by concrete slab above. See under section 01 21 00 - Allowances.

1.02 RELATED REQUIREMENTS

A. Section 01 21 00 - Allowances: Allowance for payment of Applied Fire Protection at existing unprotected steel members.

B. Section 05 12 00 - Structural Steel Framing.

C. Section 05 31 00 - Steel Decking.

D. Section 07 84 00 - Firestopping.

1.03 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2021a.

B. ASTM E736/E736M - Standard Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members 2019.

C. ASTM E760/E760M - Standard Test Method for Effect of Impact on Bonding of Sprayed Fire-Resistive Material Applied to Structural Members 1992 (Reapproved 2020).

D. ASTM E937/E937M - Standard Test Method for Corrosion of Steel by Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members 1993 (Reapproved 2020).

E. UL (FRD) - Fire Resistance Directory Current Edition.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with placement of ceiling hanger tabs, mechanical component hangers, and electrical components.

B. Preinstallation Meeting: Convene one week before starting work of this section.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittals procedures.

B. Product Data: Provide data indicating product characteristics.

C. Manufacturer's Certificate: Certify that applied fireproofing products meet or exceed requirements of Contract Documents.

D. Test Reports: Reports from reputable independent testing agencies for proposed products, indicating compliance with specified criteria, conducted under conditions similar to those on project, as follows:
   1. Bond strength.
   2. Bond impact.
   3. Compressive strength.
   4. Fire tests using substrate materials similar those on project.

E. Manufacturer's Installation Instructions: Indicate special procedures.

F. Manufacturer Reports: Indicate environmental conditions that applied fireproofing materials were installed.

G. Manufacturer's Qualification Statement.

H. Installer's Qualification Statement.

I. Shop Drawings: Show extent of fire protection required and provide installation details.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience

1.07 FIELD CONDITIONS

A. Do not apply fireproofing when temperature of substrate material and surrounding air is below 40 degrees F or when temperature is predicted to be below said temperature for 24 hours after application.

B. Provide ventilation in areas to receive fireproofing during application and 24 hours afterward, to dry applied material.

C. Provide temporary enclosure to prevent spray from contaminating air.

1.08 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a two year period after Date of Substantial Completion.
   1. Include coverage for fireproofing to remain free from cracking, checking, dusting, flaking, spalling, separation, and blistering.
   2. Reinstall or repair failures that occur within warranty period.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Applied Fire Protection:
   1. GCP Applied Technologies: www.gcpat.com/#sle.
   2. Isolatek International Corp: www.isolatek.com/#sle.
   3. Southwest Fireproofing Products Company: www.sfrm.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 APPLIED FIRE PROTECTION ASSEMBLIES

A. Provide assemblies as indicated on drawings.

B. Provide fire resistance ratings for following building elements as required by local building code:
   1. Primary structural frame, including columns, girders, and trusses, 1 hour.
   2. Bearing walls, exterior, 1 hours.
   3. Bearing walls, interior, 1 hour.
   4. Nonbearing walls and partitions, exterior, 0 hours.
   5. Nonbearing walls and partitions, interior, 0 hours.
   6. Floor construction, including supporting beams and joists, 1 hours.
   7. Roof construction, including supporting beams and joists, 1 hours.
   8. Shaft Enclosures, 2 hours.

C. Provide fire-rated assembly ratings to UL Design Nos. per plans and details.

2.03 MATERIALS

A. Applied Fire Protection Material for Interior Applications, Concealed: Manufacturer's standard factory mixed material, which when combined with water is capable of providing indicated fire resistance, and complying with following requirements:

1. Bond Strength: 150 pounds per square foot, minimum, when tested in accordance with ASTM E736/E736M when set and dry.
2. Compressive Strength: 8.33 pounds per square inch, minimum.
3. Effect of Impact on Bonding: No cracking, spalling or delamination, when tested in accordance with ASTM E760/E760M.
4. Corrosivity: No evidence of corrosion, when tested in accordance with ASTM E937/E937M.
5. Surface Burning Characteristics: Maximum flame spread index of 0 (zero) and maximum smoke developed index of 0 (zero), when tested in accordance with ASTM E84.

2.04 ACCESSORIES

A. Primer Adhesive: Of type recommended by applied fire protection manufacturer.

B. Water: Clean, potable.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive fireproofing.

B. Verify that clips, hangers, supports, sleeves, and other items required to penetrate fireproofing are in place.

C. Verify that ducts, piping, equipment, or other items that would interfere with application of fireproofing have not been installed.

D. Verify that voids and cracks in substrate have been filled.

E. Verify that projections have been removed where fireproofing will be exposed to view as a finish material.

3.02 PREPARATION

A. Perform tests as recommended by fireproofing manufacturer in applications where adhesion of fireproofing to substrate is in question.

B. Remove incompatible materials that could effect bond by scraping, brushing, scrubbing, or sandblasting.

C. Prepare substrates to receive fireproofing in strict accordance with instructions of fireproofing manufacturer.

D. Protect surfaces not scheduled for fireproofing and equipment from damage by overspray, fall-out, and dusting.

E. Close off and seal duct work in areas where fireproofing is being applied.

3.03 APPLICATION

A. Apply primer adhesive in accordance with manufacturer's instructions.

B. Apply fireproofing in uniform thickness and density as necessary to achieve required ratings.

3.04 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Section 01 40 00 - Quality Requirements.

B. Inspect installed fireproofing after application and curing for integrity, prior to its concealment.

C. Ensure that actual thicknesses, densities, and bond strengths meet requirements for specified ratings and requirements of authorities having jurisdiction (AHJ).

D. Re-inspect installed fireproofing for integrity of fire protection, after installation of subsequent Work.

3.05 CLEANING

A. Remove excess material, overspray, droppings, and debris.

B. Remove fireproofing from materials and surfaces not required to be fireproofed.

END OF SECTION 07 81 00

SECTION 07 84 00
FIRESTOPPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Firestopping of joints and penetrations in fire-resistance-rated and smoke-resistant assemblies, whether indicated on drawings or not, and other openings indicated.

B. Schedule of Firestopping.

1.02 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 01 70 00 - Execution and Closeout Requirements: Cutting and patching.

C. Section 09 21 16 - Gypsum Board Assemblies: Gypsum wallboard fireproofing.

1.03 REFERENCE STANDARDS

A. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems 2013a (Reapproved 2017).

B. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems 2015 (Reapproved 2019).

C. ASTM E2837 - Standard Test Method for Determining the Fire Resistance of Continuity Head-of-Wall Joint Systems Installed Between Rated Wall Assemblies and Nonrated Horizontal Assemblies 2013 (Reapproved 2017).

D. SCAQMD 1168 - Adhesive and Sealant Applications 1989 (Amended 2017).

E. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.

C. Product Data: Provide data on product characteristics, performance ratings, and limitations.

D. Sustainable Design Submittal: Submit VOC content documentation for nonpreformed materials.

1.05 QUALITY ASSURANCE

A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.

1.06 FIELD CONDITIONS

A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation; maintain minimum temperature before, during, and for three days after installation of materials.

B. Provide ventilation in areas where solvent-cured materials are being installed.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Firestopping Manufacturers:
   1. 3M Fire Protection Products: www.3m.com/firestop/#sle.
   2. A/D Fire Protection Systems Inc: www.adfire.com/#sle.
   3. Everkem Diversified Products, Inc; Intumescent Fire-Rated Putty Pads: www.everkemproducts.com/#sle.
   4. Grabber Construction Products, Inc; GrabberGard EFC: www.grabberman.com/#sle.

5. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 MATERIALS

A. Firestopping Materials: Any materials meeting requirements.

B. Volatile Organic Compound (VOC) Content: Provide products having VOC content lower than that required by SCAQMD 1168.

C. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.

D. Fire Ratings: Refer to drawings for required systems and ratings.

2.03 FIRESTOPPING ASSEMBLY REQUIREMENTS

A. Head-of-Wall (HW) Joint System Firestopping at Joints Between Fire-Rated Wall Assemblies and Non-Rated Horizontal Assemblies: Use system that has been tested according to ASTM E2837 to have fire resistance F Rating equal to required fire rating of wall assembly.

B. Floor-to-Floor (FF), Floor-to-Wall (FW), Head-of-Wall (HW), and Wall-to-Wall (WW) Joints, Except Perimeter, Where Both Are Fire-Rated: Use system that has been tested according to ASTM E1966 or UL 2079 to have fire resistance F Rating equal to required fire rating of the assembly in which the joint occurs.

C. Through Penetration Firestopping: Use system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.

2.04 FIRESTOPPING FOR FLOOR-TO-FLOOR, FLOOR-TO-WALL, HEAD-OF-WALL, AND WALL-TO-WALL JOINTS

A. Concrete Floors:
   1. Floor-to-Floor Joints:
      a. 2 Hour Construction: UL System FF-D-1013; Hilti CFS-SP WB Firestop Joint Spray and CP 672.

B. Gypsum Board Walls:
   1. Wall-to-Wall Joints That Have Movement Capabilities (Dynamic-D):
      a. 1 Hour Construction: UL System WW-D-0067; Hilti CP 606 Flexible Firestop Sealant.
   2. Head-of-Wall Joints at Concrete Over Metal Deck, Wall Parallel to Ribs:
      a. 1 Hour Construction: UL System HW-D-0049; Hilti CFS-SP WB Firestop Joint Spray and CP 672.
      b. 1 Hour Construction: UL System HW-D-0184; Hilti CP 606 Flexible Firestop Sealant.
   3. Head-of-Wall Joints at Concrete Over Metal Deck, Wall Perpendicular to Ribs, Cut to Fit Ribs:
      a. 1 Hour Construction: UL System HW-D-0045; Hilti CP 606 Flexible Firestop Sealant.
   4. Head-of-Wall Joints at Concrete Over Metal Deck, Wall Perpendicular to Ribs, Not Cut to Fit:
      a. 1 Hour Construction: UL System HW-D-0042; Hilti CFS-SP WB Firestop Joint Spray and CP 672.
      b. 1 Hour Construction: UL System HW-D-0045; Hilti CP 606 Flexible Firestop Sealant.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify openings are ready to receive the work of this section.

3.02 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter that shall adversely affect bond of firestopping material.

B. Remove incompatible materials that shall adversely affect bond.

3.03 INSTALLATION

A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

B. Do not cover installed firestopping until inspected by authorities having jurisdiction.

C. Install labeling required by code.

3.04 CLEANING

A. Clean adjacent surfaces of firestopping materials.

3.05 PROTECTION

A. Protect adjacent surfaces from damage by material installation.

END OF SECTION 07 84 00

This page intentionally left blank

SECTION 07 90 00
JOINT SEALANTS – EIFS AND WINDOWS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Provide all labor material, tools, equipment, transportation and services necessary for or incidental to the execution of caulking and sealant work for EIFS and windows, complete as shown on the drawings and as specified herein for both new and existing surfaces, including but not limited to the following:
   1. Sealant between aluminum frames and EIFS panels.
   2. Sealant in expansion joints between EIFS panels (EIFS/EIFS).
   3. Sealant around penetrations through EIFS such as light fixtures, hose bibs, electrical outlets, etc.
   4. Sealant joints between EIFS and concrete walkways at base of buildings.
   5. Wet glazing of windows to replace deteriorated gaskets.
   6. Miscellaneous sealants.

1.02 RELATED SECTIONS

A. Section 01 23 00 - Alternates

B. Section 07 11 00 - Elastomeric Wall Coating

C. Section 07 24 01 - Repairs to Existing Exterior Insulation and Finish System

D. Section 07 62 00 - Sheet Metal Flashing and Trim

1.03 REFERENCES

A. All references shall be latest edition per the date of this specification.
   1. ASTM C 510 - Standard Test Method for Staining and Color Change of Single- or Multicomponent Joint Sealants.
   2. ASTM C 719 - Standard Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cyclic Movement (Hockman Cycle).
   3. ASTM C 794 - Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants.
   4. ASTM C834 - Standard Specification for Latex Sealants.
   5. ASTM C 920 - Standard Specification for Elastomeric Joint Sealants.
   6. ASTM C 1087 - Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems.
   7. ASTM C 1193 - Standard Guide for Use of Joint Sealants.
   8. ASTM C 1247 - Standard Test Method for Durability of Sealants Exposed to Continuous Immersion in Liquids.
   9. ASTM C 1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants.
   10. ASTM C 1311 - Standard Specification for Solvent Release Sealants.
   11. ASTM D 2203 - Standard Test Method for Staining from Sealants.

1.04 SUBMITTALS

A. Submit under the provisions of Submit under the provisions of Section 01 30 00 and 00 72 13.

B. Product Data: Submit manufacturer's product data sheets for all products and accessories supplied under this Section, including primers, sealant chemical and performance characteristics, substrate preparation, limitations, color availability, and compatibility with wall coating material.

C. Submit safety data sheets (SDS) for products used in this Section, when requested.

D. Certificates: Submit manufacturer's certification that materials supplied under this Section meet or exceed the specified requirements, where applicable.

E. Manufacturer's Instructions: Submit manufacturer's printed instructions for mixing and application for all products supplied under this Section. Indicate special procedures, surface

preparation, and perimeter conditions requiring special attention. Include environmental limitations for application.

F. Manufacturer's Field Reports: Submit field reports by the manufacturer's field representative certifying that products supplied are being installed in a manner consistent with the manufacturer's requirements.

G. Colors: Submit manufacturer's standard color charts.

H. Submit standard cured color samples for each sealant type illustrating selected colors.

1.05 QUALITY ASSURANCE

A. Qualifications: Only prequalified contractors may perform this work. Same qualification requirements and pre-qualified list of contractors as for EIFS work. See Section 07 24 01 Repairs to Existing Exterior Insulation and Finish System for contractor qualifications and list of pre-approved contractors.

B. Maintain one copy of the Contract Documents onsite with the foreman directly in charge of work under this Section.

C. Perform work in accordance with SWRI requirements for materials and installation and in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

D. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum 10 years documented experience.

E. Applicator: Company specializing in performing the work of this Section with minimum five (5) years documented experience, and approved by manufacturer.

F. Designate one individual as project foreman who shall be on site at all times during installation.

G. Applicator shall use only qualified workers thoroughly skilled and specifically trained in the techniques of caulking, that can demonstrate their ability to fill joints solidly and neatly to the satisfaction of the Architect/Engineer.

H. Each sealant applicator shall receive and read a copy of this Section and related Specification Sections before performing any work on the Project.

I. Approved Material: Use only material approved by submittal process. Immediately remove non-approved sealants from job site.

J. Regulatory Requirements:
   1. Contractor shall follow state and federal law regarding methods of cleaning.
   2. Comply with the more stringent VOC regulations of the state of California and/or local regulations.

K. Pre-installation Meeting: The Contractor shall schedule a pre-installation meeting prior to commencing the work under this Section and secure the attendance of the Architect/Engineer and manufacturer's representative.

L. Backer Rod Installation: Do not twist backer rod together to increase backer rod thickness. Do not trim/cut backer rod to decrease thickness.

M. Field Pre-Construction Testing (Mock-Ups):
   1. Test each elastomeric sealant and joint substrate in accordance with the following, before beginning work of this Section:
      a. Install sealants in mock-ups using joint preparation methods determined by laboratory pre-construction testing.
      b. Remove existing sealant, clean joint, and install new sealant using manufacturer's recommended joint preparation methods.
      c. Install field-test joints in locations selected by Architect/Engineer.
      d. Test Method: Manufacturer's standard field adhesion test to verify joint preparation and primer required to obtain optimum adhesion of sealants to joint substrate.

e. When test indicates sealant adhesion failure, modify joint preparation, primer, or both and retest until joint passes sealant adhesion test.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Packing, Shipping, Handling, and Unloading: Deliver materials to project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multi component materials.

B. Storage and Protection: Handle materials in compliance with manufacturer's recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes. Store primers and sealants in cool dry location with ambient temperature range of 60 to 80 °F.

1.07 PROJECT ENVIRONMENTAL CONDITIONS

A. Do not apply materials specified in this Section when the temperature, precipitation, and relative humidity conditions are not within the limits set by the manufacturer.

B. Do not install primers or sealants when atmospheric temperatures or joint surface temperatures are less than 40 °F.

C. Do not install solvent curing sealants in enclosed building spaces without sufficient ventilation.

D. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.08 SEQUENCING AND SCHEDULING

A. Coordinate work under provisions of Section 00 72 13 and Section 01 30 00.

B. Coordinate the work of this Section with all Sections referencing this Section.

1.09 PERFORMANCE REQUIREMENTS

A. The sealants specified in this Section shall satisfy the following requirements for the duration of the warranty period:
   1. The installed sealant shall be totally waterproof and remain flexible.
   2. The installed sealant shall provide a watertight and airtight seal and shall not allow moisture penetration.

1.10 WARRANTY

A. Dryvit Systems, Inc. / Tremco CPG shall offer a single source limited material defect and labor to repair or replace defective material warranty stating the Products will be free from manufacturing defect and will perform as warranted in the manner specified for the stated term measured from the Date of Project Substantial Completion.
   1. Products shall include Joint Sealants, new exterior EIFS in Section 07 24 00, Elastomeric Coatings in Section 07 11 00 materials.
   2. Warranty term for Sealants shall be 20-years.
   3. A pre-construction meeting, including representatives of the Manufacturer, the Applicator / Installer, the Owner, and the Consultant (if applicable), shall be required prior to installation of the Products.

B. Contractor agrees to perform all repairs required where the sealant has not met the performance requirements of this Section.

C. The installer shall warrant workmanship separately. Dryvit / Tremco CPG shall not be responsible for workmanship associated with installation of the Outsulation System.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Compatibility: Provide joint sealants, joint fillers, waterproofing membranes and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field

experience.

2.02 SEALANTS

A. Single Component (SC) Silicone: ASTM C920, Type S, Grade NS, Class 100/50; Uses NT, M, G, A and O: single component, moisture curing, nonstaining, non-bleeding, color as selected.
   1. Spectrem 1 manufactured by Tremco Sealant/Weatherproofing Division of RPM International, Inc..

B. Multi-Component (MC) Silicone: ASTM C920, Type M, Grade NS, Class 50; Uses NT, M, G, A and O: multi-component, neutral curing, nonstaining, non-bleeding, color as selected.
   1. Spectrem 4TS manufactured by Tremco Sealant/Weatherproofing Division of RPM International, Inc.

C. For wet sealing windows, Spectrem 2 manufactured by Tremco Sealant / Weatherproofing Division of RPM International, Inc.

2.03 ACCESSORIES

A. Primers: TREMprime Silicone Metal Primer and TREMprime Silicone Porous Primer.

B. Joint Cleaner: Non-corrosive and non-staining type as recommended by sealant manufacturer and compatible with joint forming materials.

C. Joint Backing: Closed cell polyethylene foam, as manufactured by Sof-rod. Verify acceptance by sealant manufacturer and EIFS manufacturer. Oversize backer rod 30 percent larger than joint width.

D. Bond Breaker: Pressure sensitive tape as recommended by sealant manufacturer to suit application.

E. Masking Tape: Non-staining, non-absorbent material compatible with joint sealants and surfaces adjacent to joints.

F. Rags for Cleaning: White 100% tight woven, lint-free cotton.

G. Water: Clean, potable water.

H. Cleaner: As recommended for cleaning metal, glass and other surfaces (separate cleaners required for each), as required by manufacturer.

I. Cleaning Brushes: Stiff natural bristle brushes for cleaning surfaces.

J. Miscellaneous:
   1. Small bristle brushes for application of primer, nylon rollers, synthetic abrasion pads, tapes and other material necessary for the completion of the work specified under this Section.
   2. Other items not specifically mentioned but required for the proper execution of the work.

2.04 FINISHES

A. Color to be selected by the Owner's Representative.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Applicator shall examine the areas and conditions under which work of this Section will be performed.
   1. Verify conformance with Manufacturer’s requirements.
   2. Verify that all penetrations through the wall surfaces are securely attached with no movement that would impact the performance of the sealant.
   3. Verify that all existing caulking has been removed.
   4. Verify that all EIFS joint rebuilding has been completed and accepted by Architect/Engineer.
   5. Verify that the EIFS base coat repairs are fully cured and that the EIFS primer is installed and fully cured to the manufacturer’s requirement.
   6. Verify that substrate surfaces and adjoining surfaces are ready to receive work.

7. Verify that joint backing and release tapes are compatible with sealants.
8. Verify that sheathing has been properly installed and that the work had been accepted by the Architect/Engineer.

B. Do not proceed until unsatisfactory conditions are corrected.

C. Inform Architect/Engineer immediately if conditions detrimental to sealant work are found. Do not proceed with preparation work until conditions are corrected.

D. Beginning the installation shall indicate that installer accepts existing surfaces.

3.02 PREPARATION

A. Lightly grind existing metal surface (including aluminum frames) to remove residues of existing sealants, adhesives, paints and other contaminants.

B. Remove loose materials and foreign matter which might impair adhesion of sealant.

C. Blow out all joints with oil-free compressed air.

D. Clean and prime joints and surfaces in accordance with sealant manufacturer's instructions. Commencement of work shall constitute acceptance of substrate.

E. Install backing rod and release tape to create suitable depth to the sealant joint.

F. Perform preparation in accordance with manufacturer's instructions.

G. Protect elements surrounding the work of this Section from damage or disfigurement.

H. Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.03 INSTALLATION

A. Measure joint dimensions and size materials to achieve required 2:1 width/depth ratios, or as otherwise detailed.

B. Install joint backing to achieve a neck dimension no greater than ⅓ of the joint width, or as otherwise detailed.

C. Install bond breaker where joint backing is not used.

D. Apply thin film of primer with bristle brush on joint surfaces and allow to fully dry. Do not dip brushes directly in the original container of the primer (i.e. do not contaminate primer); use small clean containers to hold the primer during application. Clean containers and brushes often to prevent contamination of primer and surfaces.

E. Do not allow primer to spill or migrate onto adjoining surfaces. If sealant material is not installed within 8 hours, then perlite the surface.

F. Sealant shall be applied under pressure by cartridge type caulking gun or bulk loading gun. Install sealant in accordance with manufacturer's instructions.

G. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

H. Install sealant free of air pockets, foreign embedded matter, ridges and sags.

I. Tool joints to a slightly concave profile unless otherwise indicated on the drawings. Joint shall be tooled within 20 minutes of sealant application.

3.04 FIELD QUALITY CONTROL

A. Site Tests, Inspection:
1. The Contractor shall take periodic cut samples to test for adequate substrate adhesion.
2. Additional samples will be taken at the Architect/Engineer's discretion.
3. All test sample areas shall be repaired as part of the work included in this Section at no additional cost to Owner.

B. Manufacturer's Field Services: Secure attendance of manufacturer's representative on a periodic basis to ensure compliance with manufacturer's requirements concerning preparation, mixing, application, and finishing. Contractor to provide copies of field reports by manufacturer's representative confirming acceptable adherence to standards.

3.05 CLEANING

A. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

B. Clean work under provisions of Section 01 50 00.

C. Clean adjacent soiled surfaces.

D. Repair or replace defaced or disfigured finishes caused by work of this Section.

E. All cleaning methods and acceptable procedures are subject to the approval of the Architect/Engineer.

3.06 PROTECTION OF FINISHED WORK

A. Protect joint sealants during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs; cut out, remove, and repair damaged or deteriorated joint sealants immediately. Perform repairs so that repaired areas are indistinguishable from original work.

B. Protect finished installation under provisions of Section 01 50 00.

3.07 SCHEDULE

A.

Location	Type	Color
1. EIFS to Aluminum Frames	Spectrem 1	N/A
2. EIFS/EIFS joints	Spectrem 1	N/A
3. EIFS to Concrete columns	Spectrem 4	TBD
4. EIFS to penetrations	Spectrem 4	TBD
5. Base of wall (and Frames) to sidewalk	Spectrem 4	TBD
6. Wet sealing windows	Spectrem 2	TBD

END OF SECTION 07 90 00

SECTION 07 92 00
JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nonsag gunnable joint sealants.

B. Self-leveling pourable joint sealants.

C. Joint backings and accessories.

1.02 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions: Additional requirements for sealants and primers.

B. Section 07 84 00 - Firestopping: Firestopping sealants.

C. Section 08 80 00 - Glazing: Glazing sealants and accessories.

D. Section 09 21 16 - Gypsum Board Assemblies: Sealing acoustical and sound-rated walls and ceilings.

E. Section 09 22 16 - Non-Structural Metal Framing: Sealing between framing and adjacent construction in acoustical and sound-rated walls and ceilings.

1.03 REFERENCE STANDARDS

A. ASTM C794 - Standard Test Method for Adhesion-In-Peel of Elastomeric Joint Sealants 2018.

B. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications 2018.

C. ASTM C1087 - Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems 2016.

D. ASTM C1193 - Standard Guide for Use of Joint Sealants 2016.

E. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants 2018.

F. ASTM C1521 - Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints 2019 (Reapproved 2020).

G. SWRI (VAL) - SWR Institute Validated Products Directory Current Edition.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data for Sealants: Submit manufacturer's technical data sheets for each product to be used, that includes the following.

1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
2. List of backing materials approved for use with the specific product.
3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
4. Substrates the product should not be used on.
5. Substrates for which use of primer is required.
6. Substrates for which laboratory adhesion and/or compatibility testing is required.
7. Installation instructions, including precautions, limitations, and recommended backing materials and tools.
8. Sample product warranty.
9. Certification by manufacturer indicating that product complies with specification requirements.
10. SWRI Validation: Provide currently available sealant product validations as listed by SWRI (VAL) for specified sealants.

C. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and

recommended tools.

D. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.

E. Samples for Verification: Where custom sealant color is specified, obtain directions from Architect and submit at least two physical samples for verification of color of each required sealant.

F. Sustainable Design Documentation: For sealants and primers, submit VOC content and emissions documentation as specified in Section 01 61 16.

G. Preconstruction Laboratory Test Reports: Submit at least four weeks prior to start of installation.

H. Field Quality Control Plan: Submit at least two weeks prior to start of installation.

I. Preinstallation Field Adhesion Test Reports: Submit filled out Preinstallation Field Adhesion Test Reports log within 10 days after completion of tests; include bagged test samples and photographic records.

J. Field Quality Control Log: Submit filled out log for each length or instance of sealant installed, within 10 days after completion of inspections/tests; include bagged test samples and photographic records, if any.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of documented experience.

C. Preconstruction Laboratory Testing: Arrange for sealant manufacturer(s) to test each combination of sealant, substrate, backing, and accessories.
   1. Adhesion Testing: In accordance with ASTM C794.
   2. Compatibility Testing: In accordance with ASTM C1087.
   3. Stain Testing: In accordance with ASTM C1248; required only for stone substrates.
   4. Allow sufficient time for testing to avoid delaying the work.
   5. Deliver to manufacturer sufficient samples for testing.
   6. Report manufacturer's recommended corrective measures, if any, including primers or techniques not indicated in product data submittals.
   7. Testing is not required if sealant manufacturer provides data showing previous testing, not older than 24 months, that shows satisfactory adhesion, lack of staining, and compatibility.

D. City will employ an independent testing agency to perform the field quality control inspection and testing as referenced in PART 3 of this section and as follows, to prepare and submit the field quality control plan and log, and to provide recommendations of remedies in the case of failure.

E. Field Quality Control Plan:
   1. Visual inspection of entire length of sealant joints.
   2. Non-destructive field adhesion testing of sealant joints, except interior acrylic latex sealants.
      a. Test the entire length of every sealant joint.
   3. Field Quality Control Log Form: Show same data fields as on Preinstallation Field Adhesion Test Log, with known information filled out and lines for multiple tests per sealant/substrate combinations; include visual inspection and specified field testing; allow for possibility that more tests than minimum specified may be necessary.

F. Field Adhesion Test Procedures:
   1. Allow sealants to fully cure as recommended by manufacturer before testing.
   2. Have a copy of the test method document available during tests.

3. Take photographs or make video records of each test, with joint identification provided in the photos/videos; for example, provide small erasable whiteboard positioned next to joint.
4. Record the type of failure that occurred, other information required by test method, and the information required on the Field Quality Control Log.
5. When performing destructive tests, also inspect the opened joint for proper installation characteristics recommended by manufacturer, and report any deficiencies.
6. Deliver the samples removed during destructive tests in separate sealed plastic bags, identified with project, location, test date, and test results, to City.
7. If any combination of sealant type and substrate does not show evidence of minimum adhesion or shows cohesion failure before minimum adhesion, report results to Architect.

G. Non-Destructive Field Adhesion Test: Test for adhesion in accordance with ASTM C1521, using Nondestructive Continuous Method.

H. Destructive Field Adhesion Test: Test for adhesion in accordance with ASTM C1521, using Destructive Tail Procedure.
1. Sample: At least 18 inches long.
2. Minimum Elongation Without Adhesive Failure: Consider the tail at rest, not under any elongation stress; multiply the stated movement capability of the sealant in percent by two; then multiply 1 inch by that percentage; if adhesion failure occurs before the "1 inch mark" is that distance from the substrate, the test has failed.
3. If either adhesive or cohesive failure occurs prior to minimum elongation, take necessary measures to correct conditions and re-test; record each modification to products or installation procedures.

I. Field Adhesion Tests of Joints: Test for adhesion using most appropriate method in accordance with ASTM C1521, or other applicable method as recommended by manufacturer.

1.06 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Correct defective work within a five year period after Date of Substantial Completion.

C. Warranty: Include coverage for installed sealants and accessories that fail to achieve watertight seal , exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Non-Sag Sealants: Permits application in joints on vertical surfaces without sagging or slumping.
1. ADFAST Corporation: www.adfastcorp.com/#sle.
2. Adhesives Technology Corporation: www.atcepoxy.com/#sle.
3. Bostik Inc: www.bostik-us.com/#sle.
4. Dow: www.dow.com/#sle.
5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Self-Leveling Sealants: Pourable or self-leveling sealant that has sufficient flow to form a smooth, level surface when applied in a horizontal joint.
1. Adhesives Technology Corporation: www.atcepoxy.com/#sle.
2. Bostik Inc: www.bostik-us.com/#sle.
3. Dayton Superior Corporation: www.daytonsuperior.com/#sle.
4. Dow; [_____]: www.dow.com/#sle.
5. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 JOINT SEALANT APPLICATIONS

A. Scope:
1. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items.
a. Joints between door, window, and other frames and adjacent construction.

b. In sound-rated wall and ceiling assemblies, gaps at electrical outlets, wiring devices, piping, and other openings; between wall/ceiling and other construction; and other flanking sound paths.
   1) Exception: Such gaps and openings in gypsum board and plaster finished stud walls and suspended ceilings.
c. Other joints indicated below.

2. Do not seal the following types of joints.
   a. Joints where sealant is specified to be provided by manufacturer of product to be sealed.
   b. Joints where installation of sealant is specified in another section.
   c. Joints between suspended panel ceilings/grid and walls.

B. Interior Wet Areas: Bathrooms and restrooms; fixtures in wet areas include plumbing fixtures, countertops, and cabinets.

C. Sound-Rated Assemblies: Walls and ceilings identified as "STC-rated", "sound-rated", or "acoustical".

2.03 JOINT SEALANTS - GENERAL

A. Sealants and Primers: Provide products with levels of volatile organic compound (VOC) content as indicated in Section 01 61 16.

B. Colors: As indicated on drawings.

2.04 ACCESSORIES

A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.
1. Open Cell: 40 to 50 percent larger in diameter than joint width.
2. Closed Cell and Bi-Cellular: 25 to 33 percent larger in diameter than joint width.
3. Manufacturers:
   a. ADFAST Corporation; ADSEAL BR-2600 (Backer Rod): www.adfastcorp.com/#sle.
   b. Substitutions: See Section 01 60 00 - Product Requirements.

B. Overlay Extrusion for Glazing System Joint Protection: Rubber profiled extrusions placed over joints in glazing system and provided with watertight seal.
1. Profile: As required to match existing metal glazing cap requirements.
2. Color: As required to match existing conditions.
3. Manufacturers:
   a. Tremco Commercial Sealants & Waterproofing; Spectrem Restoratoin Overlay: www.tremcosealants.com/#sle.
   b. Substitutions: See Section 01 60 00 - Product Requirements.

C. Preformed Extruded Silicone Joint Seal: Pre-cured low-modulus silicone extrusion, in sizes to fit applications indicated on drawings, combined with a neutral-curing liquid silicone sealant for bonding joint seal to substrates.
1. Size: 1 inch wide, in rolls 100 feet long.
2. Thickness: 0.78 inch, with ridges along outside bottom edges for bonding area.
3. Color: As selected by Architect..
4. Manufacturers:
   a. Tremco Commercial Sealants & Waterproofing; Spectrem Simple Seal: www.tremcosealants.com/#sle.
   b. Substitutions: See Section 01 60 00 - Product Requirements.

D. Preformed Extruded Polyurethane Joint Seal: Medium-modulus, preformed polyurethane extrusion used to bridge joints under elastomeric wall coatings, in sizes to fit applications indicated on drawings, combined with polyurethane sealant for bonding joint seal to substrates.
1. Size: 1-1/2 inch wide, in rolls 100 feet long.
2. Thickness: 0.051 inch, with ridges along outside bottom edges for bonding area.

3. Manufacturers:
    a. Tremco Commercial Sealants & Waterproofing; Dymonic Simple Seal: www.tremcosealants.com/#sle.
    b. Substitutions: See Section 01 60 00 - Product Requirements.

E. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.

F. Joint Cleaner: Non-corrosive and non-staining type, type recommended by sealant manufacturer; compatible with joint forming materials.

G. Primers: Type recommended by sealant manufacturer to suit application; non-staining.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that joints are ready to receive work.

B. Verify that backing materials are compatible with sealants.

C. Verify that backer rods are of the correct size.

D. Preinstallation Adhesion Testing: Install a sample for each test location indicated in the test plan.
1. Test each sample as specified in PART 1 under QUALITY ASSURANCE article.
2. Notify Architect of date and time that tests will be performed, at least seven days in advance.
3. Arrange for sealant manufacturer's technical representative to be present during tests.
4. Record each test on Preinstallation Adhesion Test Log as indicated.
5. If any sample fails, review products and installation procedures, consult manufacturer, or take whatever other measures are necessary to ensure adhesion; re-test in a different location; if unable to obtain satisfactory adhesion, report to Architect.
6. After completion of tests, remove remaining sample material and prepare joint for new sealant installation.

3.02 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

E. Concrete Floor Joints That Will Be Exposed in Completed Work: Test joint filler in inconspicuous area to verify that it does not stain or discolor slab.

3.03 INSTALLATION

A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Perform installation in accordance with ASTM C1193.

C. Perform acoustical sealant application work in accordance with ASTM C919.

D. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.

E. Install bond breaker backing tape where backer rod cannot be used.

F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.

G. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless

manufacturer's approval is obtained and instructions are followed.

H. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

3.04 FIELD QUALITY CONTROL

A. City will employ an independent testing agency to perform field quality control inspection and testing as specified in PART 1 under QUALITY ASSURANCE article.

B. Non-Destructive Adhesion Testing: If there are any failures in first 100 linear feet, notify Architect immediately.

C. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.

END OF SECTION 07 92 00

SECTION 08 11 13
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. See Frame Type Schedule on Sheet A-603.

C. See Door & Frame Schedules on Sheets A-601 and A-602.

1.02 SUMMARY

A. Section Includes:
   1. Standard and custom hollow metal doors and frames.
   2. Steel sidelight, borrowed lite and transom frames.
   3. Louvers installed in hollow metal doors.
   4. Light frames and glazing installed in hollow metal doors.

B. Related Sections:
   1. Division 01 Section "General Conditions".
   2. Division 04 Section "Unit Masonry" for embedding anchors for hollow metal work into masonry construction.
   3. Division 08 Section “Flush Wood Doors”.
   4. Division 08 Section "Stile and Rail Wood Doors".
   5. Division 08 Section "Glazing" for glass view panels in hollow metal doors.
   6. Division 08 Section "Door Hardware".
   7. Division 08 Section "Barometric Louvers".
   8. Division 09 Sections "Exterior Painting" and "Interior Painting" for field painting hollow metal doors and frames.
   9. Section 28 13 00 - Access Control System: Hardware items other than specified in this section.

C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
   1. ANSI/SDI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
   2. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frames Anchors and Hardware Reinforcing.
   3. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
   4. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
   5. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.
   6. ASTM A1008 - Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
   7. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   8. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
   9. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus.
   10. ANSI/BHMA A156.115 - Hardware Preparation in Steel Doors and Frames.
   11. ANSI/SDI 122 - Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
   12. ANSI/NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
   13. ANSI/NFPA 105: Standard for the Installation of Smoke Door Assemblies.

14. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
15. UL 10C - Positive Pressure Fire Tests of Door Assemblies.
16. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, hardware reinforcements, profiles, anchors, fire-resistance rating, and finishes.

B. Door hardware supplier is to furnish templates, template reference number and/or physical hardware to the steel door and frame supplier in order to prepare the doors and frames to receive the finish hardware items.

C. Shop Drawings: Include the following:
1. Elevations of each door design.
2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of anchorages, joints, field splices, and connections.
6. Details of accessories.
7. Details of moldings, removable stops, and glazing.
8. Details of conduit and preparations for power, signal, and control systems.

D. Samples for Verification:
1. Samples are only required by request of the architect and for manufacturers that are not current members of the Steel Door Institute.

1.04 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal doors and frames through one source from a single manufacturer wherever possible.

B. Quality Standard: In addition to requirements specified, furnish SDI-Certified manufacturer products that comply with ANSI/SDI A250.8, latest edition, "Recommended Specifications for Standard Steel Doors and Frames".

C. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to UL10C (neutral pressure at 40” above sill) or UL 10C.
1. Oversize Fire-Rated Door Assemblies Construction: For units exceeding sizes of tested assemblies, attach construction label certifying doors are built to standard construction requirements for tested and labeled fire rated door assemblies except for size.
2. Temperature-Rise Limit: Where indicated and at vertical exit enclosures (stairwell openings) and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.
3. Smoke Control Door Assemblies: Comply with NFPA 105.
    a. Smoke "S" Label: Doors to bear “S” label, and include smoke and draft control gasketing applied to frame and on meeting stiles of pair doors.

D. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257. Provide labeled glazing material.

E. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for installing hollow metal doors and frames and to verify installation of electrical knockout boxes and conduit at frames with electrified or access control hardware.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project site storage. Do not use non-vented plastic.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Do not store in a manner that traps excess humidity.
   1. Provide minimum 1/4-inch space between each stacked door to permit air circulation. Door and frames to be stacked in a vertical upright position.

1.06 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.07 COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

B. Building Information Modeling (BIM) Support: Utilize designated BIM software tools and obtain training needed to successfully participate in the Project BIM processes. All technical disciplines are responsible for the product data integration and data reliability of their Work into the coordinated BIM applications.

1.08 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

PART 1 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide steel doors and frames from a SDI Certified manufacturer:
   1. CECO Door Products (C).
   2. Curries Company (CU).
   3. Pioneer Industries (PI).
   4. Steelcraft (S).
   5. Substitutions: See Section01 60 00-Product Requirements.

2.02 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

C. Frame Anchors: ASTM A 653/A 653M, Commercial Steel (CS), Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

2.03 HOLLOW METAL DOORS

A. General: Provide 1-3/4 inch doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8 and ANSI/NAAMM HMMA 867.

B. Exterior Doors: Face sheets fabricated of commercial quality hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
   1. Design: Flush panel.
   2. Core Construction: Manufacturer's standard polyurethane. Where indicated, provide doors fabricated as thermal-rated assemblies with a minimum R-value of 3.2 or better.
   3. Level/Model: Level 3 and Physical Performance Level A (Extra Heavy Duty), Minimum 16 gauge (0.053-inch - 1.3-mm) thick steel, Model 2.
   4. Vertical Edges: Vertical edges to have the face sheets spot welded and filled full height with an epoxy filler. Welds are to be ground, filled and dressed smooth. Beveled Lock Edge, 1/8 inch in 2 inches (3 mm in 50 mm).
   5. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet. Doors with an inverted top channel to include a steel closure channel, screw attached, with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable.
   6. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
   7. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

C. Interior Doors: Face sheets fabricated of commercial quality cold rolled steel that complies with ASTM A 1008/A 1008M. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
   1. Design: Flush panel.
      a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.
   2. Level/Model: Level 3 and Physical Performance Level A (Extra Heavy Duty), minimum 16 gauge (0.053-inch - 1.3-mm) thick steel, Model 2.
   3. Vertical Edges: Vertical edges to have the face sheets spot welded and filled full height with an epoxy filler. Welds are to be ground, filled and dressed smooth. Beveled Lock Edge, 1/8 inch in 2 inches (3 mm in 50 mm).
   4. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet.
   5. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
   6. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

D. Manufacturers Basis of Design:
   1. Curries Company (CU) - Polystyrene Core - 707 Series.

2.04 HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

B. Exterior Frames: Fabricated of hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60.
   1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
   2. Frames: Minimum 14 gauge (0.067-inch -1.7-mm) thick steel sheet.
   3. Manufacturers Basis of Design:
      a. Curries Company (CU) – M CM Series.

C. Interior Frames: Fabricated from cold-rolled steel sheet that complies with ASTM A 1008/A 1008M.

1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
2. Frames: Minimum 16 gauge (0.053-inch -1.3-mm) thick steel sheet.
3. Manufacturers Basis of Design:
   a. Curries Company (CU) - M Series.
4. Type FF.1 - Existing - Touch-up Damaged Finish.
   a. Step 1: Sand the damaged area
      1) Remove any existing rust or paint from the damaged area.
      2) The area should be sanded until it is smooth to the touch and no lip is felt between the metal and the paint.
   b. Step 2: Fill the damaged area
      1) Fill the damaged area with metal body filler putty.
      2) Smooth out the putty so it blends evenly with the surrounding parts of the door.
   c. Step 3: Sand the patch
      1) Once patch is dry, lightly sand the patch smooth.
      2) Remove resulting fine dust before applying the paint.
   d. Step 4: Paint the patch to match existing color
      1) Apply a very light coat of paint, allow it to fully dry and then apply another very light coat.
      2) Continue applying light coats until the patch is no longer noticeable and the door looks finished. Applying several very light coats of paint reduces the risk of paint runs and provides a nice even finish to the door.
5. Type FF.2 - Existing - Field Paint: Match existing color or existing adjacent color if existing color is indeterminant. Repaint all vertical edges.
6. Type FF.6 - Factory Primed and Field Finished: Match existing.
   a. Color to match existing adjacent frame finish.
   b. Contractor responsible for survey of existing door and frame finishes to determine exact color where finish legend indicates to match existing adjacent finish.
   c. Also refer to Door Survey appendix in this Project Manual.
7. Type FF.6A - Factory Primed and Field Finished:
   a. Color: Soft off-white with an eggshell finish unless otherwise selected by Architect.

D. Fire rated frames: Fabricate frames in accordance with NFPA 80, listed and labeled by a qualified testing agency, for fire-protection ratings indicated.

E. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.

2.05 FRAME ANCHORS

A. Jamb Anchors:
   1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, formed from A60 metallic coated material, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
   2. Stud Wall Type: Designed to engage stud and not less than 0.042 inch thick.
   3. Compression Type for Drywall Slip-on (Knock-Down) Frames: Adjustable compression anchors.

B. Floor Anchors: Floor anchors to be provided at each jamb, formed from A60 metallic coated material, not less than 0.042 inches thick.

C. Mortar Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.06 LOUVERS

A. Barometric Louvers: See Section 08 91 00 - Louvers.

B. Metal Louvers: Anemostat PLSL at exterior doors unless noted otherwise.
   1. Blade Type: Vision proof inverted V or inverted Y.

2. Metal and Finish: Galvanized steel, 0.040 inch thick, factory primed for paint finish with baked enamel or powder coated finish. Match pre-finished door paint color where applicable.

C. Louvers for Fire Rated Doors: Metal louvers with fusible link and closing device, listed and labeled for use in doors with fire protection rating of 1-1/2 hours and less.
1. Manufacturers: Subject to compliance with requirements, provide louvers to meet rating indicated.
2. Metal and Finish: Galvanized steel, 0.040 inch thick, factory primed for paint finish with baked enamel or powder coated finish. Match pre-finished door paint color where applicable.

2.07 LIGHT OPENINGS AND GLAZING

A. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints at fabricator's shop. Fixed and removable stops to allow multiple glazed lites each to be removed independently. Coordinate frame rabbet widths between fixed and removable stops with the type of glazing and installation indicated.

B. Moldings for Glazed Lites in Doors and Loose Stops for Glazed Lites in Frames: Minimum 20 gauge thick, fabricated from same material as door face sheet in which they are installed.

C. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch (16 mm) high unless otherwise indicated. Provide fixed frame moldings and stops on outside of exterior and on secure side of interior doors and frames.

D. Preformed Metal Frames for Light Openings: Manufacturer's standard frame formed of 0.048-inch-thick, cold rolled steel sheet; with baked enamel or powder coated finish; and approved for use in doors of fire protection rating indicated. Match pre-finished door paint color where applicable.

2.08 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

B. Grout Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.09 FABRICATION

A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. When shipping limitations so dictate, frames for large openings are to be fabricated in sections for splicing or splining in the field by others.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/SDI A250.8.

C. Hollow Metal Doors:
1. Exterior Doors: Provide optional weep-hole openings in bottom of exterior doors to permit moisture to escape where specified.
2. Glazed Lites: Factory cut openings in doors with applied trim or kits to fit. Factory install glazing where indicated.
3. Astragals: Provide overlapping astragals as noted in door hardware sets in Division 08 Section "Door Hardware" on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted.
4. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge strap for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".

D. Hollow Metal Frames:
1. Shipping Limitations: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

2. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
    a. Welded frames are to be provided with two steel spreaders temporarily attached to the bottom of both jambs to serve as a brace during shipping and handling. Spreader bars are for bracing only and are not to be used to size the frame opening.
3. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
4. High Frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at door openings 48-inches and wider with mortise butt type hinges at top hinge locations.
5. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge straps for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".
6. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops, provide security screws at exterior locations.
7. Mortar Guards: Provide guard boxes at back of hardware mortises in frames at all hinges and strike preps regardless of grouting requirements.
8. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
9. Jamb Anchors: Provide number and spacing of anchors as follows:
    a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
        1) Two anchors per jamb up to 60 inches high.
        2) Three anchors per jamb from 60 to 90 inches high.
        3) Four anchors per jamb from 90 to 120 inches high.
        4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
    b. Stud Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
        1) Three anchors per jamb up to 60 inches high.
        2) Four anchors per jamb from 60 to 90 inches high.
        3) Five anchors per jamb from 90 to 96 inches high.
        4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
        5) Two anchors per head for frames above 42 inches wide and mounted in metal stud partitions.
10. Door Silencers: Except on weatherstripped or gasketed doors, drill stops to receive door silencers. Silencers to be supplied by frame manufacturer regardless if specified in Division 08 Section "Door Hardware".
11. Bituminous Coating: Where frames are fully grouted with an approved Portland Cement based grout or mortar, coat inside of frame throat with a water based bituminous or asphaltic emulsion coating to a minimum thickness of 3 mils DFT, tested in accordance with UL 10C and applied to the frame under a 3rd party independent follow-up service procedure.

E. Hardware Preparation: Factory prepare hollow metal work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."
    1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
    2. Reinforce doors and frames to receive non-template, mortised and surface mounted door hardware.
    3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.

4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

2.10 STEEL FINISHES

A. Prime Finishes: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.
   1. Shop Primer: Manufacturer's standard, fast-curing, lead and chromate free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; and compatible with substrate and field-applied coatings.

PART 1 EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. General Contractor to verify the accuracy of dimensions given to the steel door and frame manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Remove welded in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation, adjust and securely brace welded hollow metal frames for square, level, twist, and plumb condition.

C. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."

D. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.

3.03 INSTALLATION

A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 and NFPA 80 at fire rated openings.
   1. Set frames accurately in position, plumbed, leveled, aligned, and braced securely until permanent anchors are set. After wall construction is complete and frames properly set and secured, remove temporary braces, leaving surfaces smooth and undamaged. Shim as necessary to comply with installation tolerances.
   2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
   3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar.
   4. Grout Requirements: Do not grout head of frames unless reinforcing has been installed in head of frame. Do not grout vertical or horizontal closed mullion members.

C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.
   1. Non-Fire-Rated Standard Steel Doors:
      a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
      b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
      c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
      d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

D. Field Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

3.04 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow metal work immediately after installation.

C. Prime-Coat and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanized openings) or finish paint.

END OF SECTION 08 11 13

This page intentionally left blank

SECTION 08 14 16
FLUSH WOOD DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Flush wood doors; flush and flush glazed configuration; fire-rated, non-rated, acoustical, and special function.

B. See Door & Frame Type Schedule and Legends on Sheet A-603.

C. See Door Schedules on Sheets A-601 and A-602.

D. Requirements for existing doors to remain , see section 3.01.

1.02 RELATED REQUIREMENTS

A. Section 06 20 00 - Finish Carpentry: Wood door frames.

B. Section 08 11 13 - Hollow Metal Doors and Frames.

C. Section 08 34 53 - Bullet-Resistant Doors and Frames

D. Section 08 70 00 - Door Hardware.

E. Section 08 80 00 - Glazing.

F. Section 08 91 00 - Louvers.

1.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials Current Edition.

B. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass 2018.

C. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements 2009 (Reapproved 2016).

D. ASTM E413 - Classification for Rating Sound Insulation 2016.

E. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition 2014, with Errata (2016).

F. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 4.0 2021.

G. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.

C. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, site finishing, cutouts for glazing, and other details.
   1. Provide information as required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).
   2. Contractor to perform site survey and include finish detail for all existing doors indicated to be touched up or refinished, and on new doors where they are indicated to match existing adjacent door finish on shop drawings. Refer to Door Schedules and Finish Legends, sheets A-601 and A-602. Contractor responsible for identification of all existing finishes to be matched.

D. Samples: Submit two samples of each type of door veneer, 4 by 4 inches in size illustrating wood grain, stain color, and sheen or paint color for each finish. Various door finishes will be applied throughout both buildings. With maximizing reuse of existing doors, new and existing doors will match across a floor. Finishes will vary floor to floor. Refer to Door Schedules and

Finish Legends, sheets A-601 and A-602.

E. Existing door location plan schedule: number and tag all exisitng doors that will remain for removal and storage in a secure l on or off-site in secure location for protection during construction.

F. Certificate: Submit labels and certificates required by quality assurance and quality control programs.

G. Test Reports: Show compliance with specified requirements for the following:
   1. Sound-retardant doors and frames; sealed panel tests are not acceptable.

H. Manufacturer's Installation Instructions: Indicate special installation instructions.

I. Warranty, executed in City's name.

1.05 QUALITY ASSURANCE

A. Maintain one copy of the specified door quality standard on site for review during installation and finishing.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section, with not less than three years of documented experience.
   1. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.

C. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.

D. Quality Certification:
   1. Provide labels or certificates indicating that the installed work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.
   2. Provide designated labels on shop drawings as required by certification program.
   3. Provide designated labels on installed products as required by certification program.
   4. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Package, deliver and store doors in accordance with specified quality standard.

B. Accept doors on site in manufacturer's packaging, and inspect for damage.

C. Protect doors with resilient packaging sealed with heat shrunk plastic; do not store in damp or wet areas or areas where sunlight might bleach veneer; seal top and bottom edges with tinted sealer if stored more than one week, and break seal on site to permit ventilation.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Interior Doors: Provide manufacturer's warranty for the life of the installation.

C. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Wood Veneer Faced Doors:
   1. Basis of Design: Oregon Door; Architectural Series: www.oregondoor.com/#sle.
   2. Haley Brothers: www.haleybros.com/#sle.
   3. Krieger Specialty Products: www.kriegerproducts.com/#sle.
   4. Masonite Architectural: www.architectural.masonite.com/#sle.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Medium-Density Overlay (MDO) Faced Doors for Opaque Finish:

1. Same manufacturer as Wood Veneer Faced Doors.
2. Substitutions: See Section 01 60 00 - Product Requirements.

C. Sound-Rated Wood Doors:
1. Same manufacturer as Wood Veneer Faced Doors.
2. Basis of Design: Oregon Door; Architectural Series Acoustic Core STC 45: www.oregondoor.com/#sle.
3. Substitutions: See Section 01 60 00 - Product Requirements.

D. Bullet Resistant Wood Doors: See Section 08 34 53 - Bullet-Resistant Doors and Frames.

2.02 DOORS AND PANELS

A. Doors: See drawings for locations and additional requirements.
1. Quality Standard: Custom Grade, Heavy Duty performance, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Interior Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.
1. Provide solid core doors at each location.
2. Fire Rated Doors: Tested to ratings indicated on drawings in accordance with UL 10C - Positive Pressure; Underwriters Laboratories Inc (UL) or Intertek/Warnock Hersey (WHI) labeled without any visible seals when door is open.
3. Sound-Rated Doors: Minimum STC as indicated on drawings, calculated in accordance with ASTM E413, tested in accordance with ASTM E90.
4. Bullet-Resistant Doors: See Section 08 34 53.
5. Wood veneer facing with factory transparent finish as indicated on drawings.
6. Medium-Density Overlay (MDO) Faced Doors for field opaque finish as indicated on drawings.

2.03 DOOR AND PANEL CORES

A. Non-Rated Solid Core and 20 Minute Rated Doors: Type Agrifiber Core, plies and faces as indicated.

B. Fire-Rated Doors: Mineral core type, with fire resistant composite core (FD), plies and faces as indicated above; with core blocking as required to provide adequate anchorage of hardware without through-bolting.

C. Sound-Rated Doors (STC 45): See door schedule for locations. Provide Acoustic Core STC 45 core (AWAC4501)) construction as required to achieve STC rating; plies and faces as indicated above.

D. Sound-Rated Doors (STC 40): See door schedule for locations. Provide solid core door. See door hardware schedule for acoustic measures applied to door. No STC rating or label required on door.

2.04 DOOR FACINGS

A. Type DF.1 - Existing - Touch-up Damaged Finish:
1. Punctures and Chips
a. Clean the surface of the door to eliminate dust and other debris before performing any internal door restoration.
b. Cut loose or jagged wood away from the edges of the hole.
c. Fill the hole with expanding foam insulation if existing door is hollow core.
d. Cut or sand off the excess insulation.
e. Apply color-matched wood filler to the surface.
f. When the filler dries, sand off the excess until the surface is completely smooth.
g. Reapply matching paint or stain and sealer.
2. Dents
a. Clean the surface of the door to eliminate dust and other debris before performing any internal door restoration.
b. When the area is dry, sand it lightly to remove any small protrusions.

c. Fill the dent with color-matched wood filler and use a putty knife or similar tool to smooth the surface before the filler has a chance to harden.
d. Once the wood filler has dried, gently sand the area until it forms a smooth, level surface.
e. Reapply matching paint or stain and sealer.

B. Type DF.2 - Existing - Field Paint: Match existing color or existing adjacent color if existing color is indeterminant. Repaint both panel sides and all vertical edges.

C. Type DF.3 - Veneer Facing for Transparent Finish: Match existing adjacent species and veneer grade.
1. Contractor responsible for survey of existing door and frame finishes to determine exact species, color and finish where finish legend indicates to match existing adjacent finish.
2. Also refer to Door Survey appendix in this Project Manual.
3. Vertical Edges: Any option allowed by quality standard for grade.
4. "Running Match" each pair of doors and doors in close proximity to each other.
5. "Pair Match" each pair of doors; "Set Match" pairs of doors within 10 feet of each other when doors are closed.

D. Type DF.3A - Veneer Facing for Transparent Finish: Fir, veneer grade in accordance with quality standard indicated, plain sliced (flat cut), with book match between leaves of veneer, running match of spliced veneer leaves assembled on door or panel face.
1. Vertical Edges: Any option allowed by quality standard for grade.
2. "Running Match" each pair of doors and doors in close proximity to each other.
3. "Pair Match" each pair of doors; "Set Match" pairs of doors within 10 feet of each other when doors are closed.

E. Type DF.4 - Veneer Facing for Opaque Finish: Medium density overlay (MDO), in compliance with indicated quality standard.
1. Color to match existing adjacent door finish.
2. Contractor responsible for survey of existing door and frame finishes to determine exact color where finish legend indicates to match existing adjacent finish.
3. Also refer to Door Survey appendix in this Project Manual.

F. Type DF.4A - Veneer Facing for Opaque Finish: Medium density overlay (MDO), in compliance with indicated quality standard.
1. Color: Soft off-white with an eggshell finish unless otherwise selected by Architect.

2.05 DOOR CONSTRUCTION

A. Fabricate doors in accordance with door quality standard specified.

B. Cores Constructed with stiles and rails:
1. Provide solid blocks at lock edge for hardware reinforcement.
2. Provide solid blocking for other throughbolted hardware.

C. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.

D. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.
1. Exception: Doors to be field finished.

E. Provide edge clearances in accordance with the quality standard specified.

2.06 FINISHES - WOOD VENEER DOORS

A. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
1. Transparent:
a. Finish: WDMA TR-6 catalyzed polyurethane.
b. Stain: As selected by Architect.
c. Sheen: Flat.

B. Seal door top edge with color sealer to match door facing.

2.07 ACCESSORIES

A. Hollow Metal Door Frames: See Section 08 11 13.

B. Hardware: See Section 08 71 00.

C. Louvers: See Section 08 91 00.

D. Glazed Openings:
   1. Heat-Strengthened and Fully Tempered Glass: ASTM C1048.
   2. See Section 08 80 00 - Glazing.

PART 3 EXECUTION

3.01 EXAMINATION

A. Existing doors to remain: Contractor shall number all existing doors to remain, remove and protect during construction, store off-site or on-site in secure location touch-up and refinish where indicated on Door Finish Legends. At the end of contruction reinstall in same location.

B. Verify existing conditions before starting work.

C. Verify that opening sizes and tolerances are acceptable.

D. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.02 INSTALLATION

A. Install doors in accordance with manufacturer's instructions and specified quality standard.

B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.

C. Use machine tools to cut or drill for hardware.

D. Coordinate installation of doors with installation of frames and hardware.

3.03 TOLERANCES

A. Comply with specified quality standard for fit and clearance tolerances.

B. Comply with specified quality standard for telegraphing, warp, and squareness.

3.04 ADJUSTING

A. Adjust doors for smooth and balanced door movement.

B. Adjust closers for full closure.

END OF SECTION 08 14 16

This page intentionally left blank

SECTION 08 31 00
ACCESS DOORS AND PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall and ceiling mounted access units.

B. Schedule of Access Door and Panel Locations.

1.02 RELATED REQUIREMENTS

A. Section 09 91 23 - Interior Painting: Field paint finish.

1.03 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.

B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2019.

1.04 SUBMITTALS

A. Product data shall be provided indicating the levels of post- and pre-consumer recycled content.

B. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

C. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.

D. Manufacturer's Installation Instructions: Indicate installation requirements.

PART 2 PRODUCTS

2.01 ACCESS DOORS AND PANELS ASSEMBLIES

A. Wall-Mounted Units with Return Air Grille:
   1. Material: Steel, hot-dipped zinc or zinc-aluminum-alloy coated.
   2. Size: 12 by 12 inches.
   3. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
   4. Wall Mounting Criteria: Provide surface-mounted face frame and door surface flush with frame surface.
   5. Gypsum Board Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.
   6. Plaster Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.
   7. Masonry Mounting Criteria: Provide surface-mounted frame with door surface flush with frame surface.

B. Wall-Mounted Units in Wet Areas:
   1. Panel Material: Steel, hot-dipped zinc, or zinc-aluminum-alloy coated.
   2. Size: 12 by 12 inches.

C. Ceiling-Mounted Units - Suspended gypsum board ceilings:
   1. Location: As indicated on drawings.
   2. Material: Steel, hot-dipped zinc or zinc-aluminum-alloy coated.
   3. Size - Lay-In Grid Ceilings: To match module of ceiling grid.
   4. Size in Other Ceilings: 30 x 30 inch, unless otherwise indicated.
   5. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.

D. Ceiling-Mounted Units - Suspended gypsum board ceilings:
   1. Location: As indicated on drawings.
   2. Material: Steel, hot-dipped zinc or zinc-aluminum-alloy coated.
   3. Size - Lay-In Grid Ceilings: To match module of ceiling grid.
   4. Size in Other Ceilings: 24 x 24 inch, unless otherwise indicated.
   5. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.

E. Ceiling-Mounted Units - Framed gypsum board ceilings:
   1. Location: As indicated on drawings.
   2. Material: Steel, hot-dipped zinc or zinc-aluminum-alloy coated.
   3. Size - Lay-In Grid Ceilings: To match module of ceiling grid.
   4. Size in Other Ceilings: 30 by 30 inch, unless otherwise indicated.
   5. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.

2.02 WALL AND CEILING MOUNTED ACCESS UNITS

A. Manufacturers:
   1. ACUDOR Products Inc: www.acudor.com/#sle.
      a. Wall and Ceiling Mounted Units: ACUDOR UF-5000.
      b. Material: Up to 16" X 16" - 16 gauge, 18 gauge mounting frame, over 16" X 16" - 14 gauge door, 16 gauge mounting frame.
      c. Finish: Prime coat of White alkyd baked enamel.
      d. Lock: Cylinder lock and key or cam latch.
      e. Hinge: Continuous, concealed.
      f. Door: Flush to frame with rounded safety corners.
      g. Mounting Frame: One piece outer flange welded to mounting frame.
      h. Ceiling-Mounted Units: ACUDOR GFRG - R.
      i. Wall and Ceiling Mounted Units: ACUDOR DW-5058.
   2. Babcock-Davis: www.babcockdavis.com.
   3. Cendrex, Inc: www.cendrex.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that rough openings are correctly sized and located.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to proceeding with this work.

B. Prepare surfaces using methods recommended by manufacturer for applicable substrates in accordance with project conditions.

3.03 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Install frames plumb and level in openings, and secure units rigidly in place.

C. Position units to provide convenient access to concealed equipment when necessary.

END OF SECTION 08 31 00

SECTION 08 33 13
COILING COUNTER DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-fire-rated coiling counter doors and operating hardware.

1.02 RELATED REQUIREMENTS

A. Section 07 92 00 - Joint Sealants: Sealing joints between frames and adjacent construction.

B. Section 09 91 23 - Interior Painting: Field paint finish.

1.03 REFERENCE STANDARDS

A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes 2020.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturer's standard literature showing materials and details of construction and finish. Include data on electrical operation.

C. Shop Drawings: Indicate rough and actual opening dimensions, anchorage methods, hardware locations, and installation details.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Coiling Counter Doors:
   1. C.H.I. Overhead Doors; Model 6522 (steel): www.chiohd.com/#sle.
   2. Raynor Garage Doors: www.raynor.com/#sle.
   3. Alpine Overhead Doors, Inc: www.alpinedoors.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 COILING COUNTER DOORS

A. Coiling Counter Doors, Non-Fire-Rated: Aluminum slat curtain.
   1. Mounting: Between jambs, within prepared opening.
   2. Nominal Slat Size: 1-1/4 inches wide.
   3. Slat Profile: Flat, perforated.
   4. Finish, Aluminum: Anodized.
   5. Guides: Formed track; same material and finish unless otherwise indicated.

2.03 MATERIALS

A. Curtain Construction: Interlocking, single thickness slats.
   1. Slat Ends: Alternate slats fitted with end locks to act as wearing surface in guides and to prevent lateral movement.
   2. Curtain Bottom: Fitted with angles to provide reinforcement and positive contact in closed position.
   3. Aluminum Slats: ASTM B221 (ASTM B221M), aluminum alloy Type 6063; minimum thickness 0.05 inch.

B. Guide Construction: Continuous, of profile to retain door in place, with mounting brackets of same metal.
   1. Aluminum Guides: Extruded aluminum channel, with wool pile runners along inside.

C. Lock Hardware:
   1. Latchset Lock Cylinders: Standard mortise cylinder type; keyed differently.
   2. Latching Mechanism: Inside mounted, adjustable keeper, spring activated latch bar feature to keep in locked or retracted position.
   3. Latch Handle: Manufacturer's standard.

D. Roller Shaft Counterbalance: Steel pipe and torsion steel spring system, capable of producing torque sufficient to ensure smooth operation of curtain from any position and capable of holding position at mid-travel; with adjustable spring tension; requiring 25 lb nominal force to operate.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that opening sizes, tolerances and conditions are acceptable.

3.02 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.

C. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.

D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.

3.03 TOLERANCES

A. Maintain dimensional tolerances and alignment with adjacent work.

B. Maximum Variation From Plumb: 1/16 inch.

C. Maximum Variation From Level: 1/16 inch.

D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 ft straight edge.

3.04 ADJUSTING

A. Adjust operating assemblies for smooth and noiseless operation.

3.05 CLEANING

A. Clean installed components.

B. Remove labels and visible markings.

END OF SECTION 08 33 13

SECTION 08 34 53
BULLET-RESISTANT DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Hollow metal bullet-resistant frames

B. Bullet-resistant wood doors.

C. See Door and Frame Schedules on Sheets A-601 and A-602.

D. See Door and Frame Types on Sheet A-603.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Section 13 07 00 - Bullet-Resistant Fiberglass Armor Panels.

C. Section 28 13 00 - Access Control System: Hardware items other than specified in this section.

1.03 REFERENCE STANDARDS

A. Underwriters Laboratory UL 752-Standard for Bullet Resisting Equipment, ASTM C 1172 - Standard Specification for Laminated Architectural Flat Glass, NIJ Standard 0108.01 - (National Institute of Justice) Standard for Ballistic Resistant Protective Materials (September, 1985).

1.04 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, hardware reinforcements, profiles, anchors, fire-resistance rating, and finishes.

B. Templates: Door hardware supplier is to furnish templates, template reference number and/or physical hardware to the steel door and frame supplier in order to prepare the doors and frames to receive the finish hardware items.

C. Shop Drawings: Include the following:
   1. Elevations of each door design.
   2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
   3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
   4. Locations of reinforcement and preparations for hardware.
   5. Details of each different wall opening condition.
   6. Details of anchorages, joints, field splices, and connections.
   7. Details of accessories.
   8. Details of moldings, removable stops, and glazing.
   9. Details of preparations for power, signal, and control systems.

D. Samples for Verification:
   1. Samples are only required by request of the architect and for manufactures that are not current members of the Steel Door Institute.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver bullet resistant hollow metal work palletized and crated to provide protection during transit and Project-site storage. Do not use non-vented plastic.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store bullet resistant hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch- (102-mm-) high wood blocking. Do not store in a manner that traps excess humidity.

1. Provide minimum 1/4-inch (6-mm) space between each stacked door to permit air circulation. Door and frames to be stacked in a vertical upright position.

1.06 DESIGN PERFORMANCE

A. Through the design, manufacturing techniques and material application the TSS Bullet Resistant Wood Door shall be constructed of a wood core lined with a sheet of fiberglass. With a UL Standard 752 Level 1-5 rating. Door frame to have no exposed fasteners, all joint connections to have concealed clips to provide rigid assembly when installed. Exterior laminated and finish painted to match customer specification.

1.07 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.08 COORDINATION

A. Coordinate installation of anchorages for bullet resistant hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.09 WARRANTY

A. Provide manufacturer's written 5 year warranty against defects in materials and workmanship upon final completion and acceptance of Work in this section.

PART 1 PRODUCTS

2.01 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

C. Frame Anchors: ASTM A 653/A 653M, Commercial Steel (CS), Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

2.02 MANUFACTURERS

A. Basis of Design: Bullet Guard: 3963 Commerce Dr. West, Sacramento, CA 95691, 916-373-0402. Web: www.bulletguard.com.

B. Total Security Solutions, Inc, 170 National Park Drive, Fowlerville, MI 48836, 800- 513-1468, Attn: Sales Department, info@tssbulletproof.com. Web: www.tssbulletproof.com .

C. North American Bullet Proof: 1144 Guadalupe Dr., Cibolo TX, 78108. 210-225-0982. Attn. Kris Tatsch. Web: www.nabulletproof.com.

D. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 BULLET RESISTANT HOLLOW METAL FRAMES

A. Fabrication:
   1. Fabricate bullet resistant hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. When shipping limitations so dictate, frames for large openings are to be fabricated in sections for splicing or splining in the field by others.
   2. Tolerances: Fabricate bullet resistant hollow metal work to tolerances indicated in ANSI/SDI A250.8.

B. Bullet Resistant Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

1. Welded Frames: Full depth continuously weld frame seams; grind, fill, dress, and make smooth and flush.
    a. Welded frames are to be provided with two steel spreaders temporarily attached to the bottom of both jambs to serve as a brace during shipping and handling. Spreader bars are for bracing only and are not to be used to size the frame opening.
2. High Frequency Hinge Reinforcement: Provide 12 gage angle reinforcements for butt type hinges on every door and frame assembly.
3. Continuous Hinge Reinforcement: Provide welded continuous 12 gage straps for continuous hinges specified in hardware sets in Division 08 Section, "Door Hardware".
4. Electrical Knock Out Boxes: Factory weld 18 gage electrical knock out boxes to frame for electrical hardware preps; this includes but not limited to electric through wire transfer hardware, electrical raceways and wiring harnesses, door position switches, electric strikes, magnetic locks, and jamb mounted card readers as noted in door hardware sets in Division 08 Section, "Door Hardware".
    a. Provide electrical knock out boxes as required for Project.
    b. Conduit to be coordinated and installed in the field (Division 26) from middle hinge box and strike box to door position box.
    c. Electrical knock out boxes to comply with NFPA requirements and fit electrical door hardware as specified in hardware sets in Division 08 Section, "Door Hardware".
    d. Electrical knock out boxes for continuous hinges should be located in the center of the vertical dimension on the hinge jamb.
5. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
6. Jamb Anchors: Provide number and spacing of anchors as follows:
    a. Masonry Types: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:
        1) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 84 inches (2137 mm) high.

C. Surface Hardware Preparation: Factory prepare bullet resistant hollow metal work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section, "Door Hardware."
1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
2. Reinforce doors and frames to receive non-template, mortised and surface-mounted door hardware.
3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of bullet resistant hollow metal work for hardware.
    a. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

2.04 STEEL FINISHES

A. Prime Finish: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.

B. Shop Primer: Manufacturer's standard, fast-curing, lead and chromate free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

2.05 BULLET RESISTANT WOOD DOORS

A. Finish: Wood veneer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. General Contractor to verify the accuracy of dimensions given to door and frame manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation, adjust and securely brace welded bullet resistant hollow metal frames for squareness, alignment, twist, and plumbness.

C. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."

D. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.

3.03 INSTALLATION

A. General: Install bullet resistant hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Bullet Resistant Hollow Metal Frames: Install bullet resistant hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11.
   1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged. Shim as necessary to comply with installation tolerances.
      a. At fire-protection-rated openings, install frames according to NFPA 80.
      b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
      c. Install door silencers in frames before grouting.
   2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.

C. Bullet Resistant Hollow Metal Doors: Fit bullet resistant hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.
   1. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

3.04 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including bullet resistant hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from bullet resistant hollow metal work immediately after installation.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

3.05 FIELD QUALITY CONTROL

A. Field Inspection (Punch Report): Reference Division 01 Sections “Closeout Procedures”. Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted.

Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.

1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

END OF SECTION 08 34 53

This page intentionally left blank

SECTION 08 43 13
ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum-framed storefront, with vision glass.

B. Aluminum doors and frames.

C. Existing aluminum frames to be modified.

D. See Door & Frame Schedules on Sheets A-601 and A-602.

E. See Door and Frame Types on Sheet A-603.

F. Weatherstripping.

G. Door hardware.

1.02 RELATED REQUIREMENTS

A. Section 05 50 00 - Metal Fabrications: Steel attachment devices.

B. Section 07 25 00 - Weather Barriers: Sealing framing to weather barrier installed on adjacent construction.

C. Section 07 92 00 - Joint Sealants: Sealing joints between frames and adjacent construction.

D. Section 08 71 00 - Door Hardware: Hardware items other than specified in this section.

E. Section 08 80 00 - Glazing: Glass and glazing accessories.

F. Section 28 13 00 - Access Control System: Hardware items other than specified in this section.

1.03 REFERENCE STANDARDS

A. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site 2015.

B. AAMA 501.2 - Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems 2015.

C. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes 2020.

D. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric) 2013.

E. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen 2019.

F. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference 2014 (Reapproved 2021).

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, door hardware, and internal drainage details.

C. Shop Drawings:

1. Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required. Include details for existing storefront systems to be modified, show interface with new work.
2. At exterior openings, include all required flashing and weatherization details for a tight fit and to maintain warranty.

D. Samples: Submit two samples 6 by 6 inches in size illustrating finished aluminum surface, glass, infill panels, glazing materials. To match existing storefronts per Architect's approval.

E. Hardware Schedule: Complete itemization of each item of hardware to be provided for each door, cross-referenced to door identification numbers in Contract Documents.

1.05 QUALITY ASSURANCE

A. Designer Qualifications: Design structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State in which the Project is located.

B. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

C. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Handle products of this section in accordance with AAMA CW-10.

B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

C. Protect existing aluminum storefront systems to remain in place.

1.07 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

1.08 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.

D. Provide five year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: Oldcastle Building Envelope; www.oldcastlebe.com/#sle.

B. Other Acceptable - Aluminum-Framed Storefronts Manufacturers:
   1. Arcadia, Inc: www.arcadiainc.com/#sle.
   2. Kawneer North America: www.kawneer.com/#sle.
   3. Tubelite, Inc: www.tubeliteinc.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ALUMINUM-FRAMED STOREFRONT

A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
   1. Thermally broken frame.
   2. Glazing Position: Front-set. Match existing.
   3. Vertical Mullion Dimensions: match existing.
   4. Finish: Class I color anodized. Match existing.
      a. Factory finish all surfaces that will be exposed in completed assemblies.
      b. Match existing storefront finish as approved by Architect.
   5. Finish Color: Match existing storefront color as approved by Architect..

6. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
7. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
8. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
9. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
10. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
11. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.

B. Performance Requirements
1. Wind Loads: Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
a. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
2. Air Leakage: 0.06 cfm/sq ft maximum leakage of storefront wall area when tested in accordance with ASTM E283/E283M at 1.57 psf pressure difference.

2.03 COMPONENTS

A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system. Match existing profiles.
1. Glazing Stops: Flush.

B. Swing Doors: Glazed aluminum. Narrow stile to match existing.
1. Thickness: 1-3/4 inches.
2. Top Rail: 4 inches wide.
3. Vertical Stiles: 4-1/2 inches wide.
4. Bottom Rail: 10 inches wide.
5. Glazing Stops: Square.
6. Finish: Same as storefront.

2.04 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Fasteners: Stainless steel.

C. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

2.05 FINISHES

A. Color: Medium bronze to match existing window systems. Contractor to field verify exact color.

2.06 HARDWARE

A. For each door, include weatherstripping, sill sweep strip, and threshold.

B. Weatherstripping: Wool pile, continuous and replaceable; provide on all doors.

C. Sill Sweep Strips: Resilient seal type, retracting, of neoprene; provide on all doors.

D. Threshold: Extruded aluminum, one piece per door opening, ribbed surface; provide on all doors.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

B. Verify that wall openings and adjoining air and vapor seal materials are ready to receive work of this section.

3.02 INSTALLATION

A. Install wall system in accordance with manufacturer's instructions.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Provide thermal isolation where components penetrate or disrupt building insulation.

F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.

G. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.

H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

I. Set thresholds in bed of sealant and secure.

J. Install hardware using templates provided.

K. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 TOLERANCES

A. Maximum Variation from Plumb: 0.06 inch per 3 feet non-cumulative or 0.06 inch per 10 feet, whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.04 FIELD QUALITY CONTROL

3.05 ADJUSTING

A. Adjust operating hardware and sash for smooth operation.

3.06 CLEANING

A. Remove protective material from pre-finished aluminum surfaces.

3.07 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION 08 43 13

SECTION 08 43 16
BULLET RESISTANT ALUMINUM DOOR & FRAME ASSEMBLY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Bullet-Resistant Aluminum Door & Frame Assembly.

B. See Door & Frame Schedules on Sheets A-601 and A-602.

C. See Door and Frame Types on Sheet A-603.

1.02 RELATED REQUIREMENTS

A. Section 01 10 00 - Summary: Contract descriptions, description of alterations work, work by others, future work, occupancy conditions, use of site and premises, work sequence.

B. Section 01 30 00 - Administrative Requirements: Submittal procedures, project meetings, progress schedules and documentation, reports, coordination.

C. Section 01 40 00 - Quality Requirements: Procedures for testing, inspection, mock-ups, reports, certificates; use of reference standards.

D. Section 01 78 00 - Closeout Submittals: Project record documents, operation and maintenance (O&M) data, warranties and bonds.

E. Section 08 71 00 - Door Hardware.

F. Section 09 21 16 - Gypsum Board Assemblies: Bullet-resistant sheathing and wallboard for bullet-resistant partitions and walls.

G. Section 09 91 23 -Interior Painting: Field painting.

H. Section 13 07 00 - Bullet Resistant Fiberglass Armor Panels: bullet resistant wall assembly construction.

1.03 REFERENCE STANDARDS

A. Underwriters Laboratory UL 752-Standard for Bullet Resisting Equipment, ASTM C 1172 - Standard Specification for Laminated Architectural Flat Glass, NIJ Standard 0108.01 - (National Institute of Justice) Standard for Ballistic Resistant Protective Materials (September, 1985). ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate, ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Submit for approval prior to fabrication: samples, product data (including preparation, storage and installation methods), cuts & anchor spacing, reinforcement & location , product specifications, shop drawings, test reports (current UL Listing Verification & UL 752 Test Results as provided by Underwriters Laboratories), and printed data in sufficient detail to indicate compliance with the contract documents.

C. Provide manufacturer's instructions for installation and cleaning of TSS Bullet Resistant BL2.5. All required submittals shall be approved prior to installation.

D. Test reports (current UL Listing Verification & UL 752 Test Results as provided by Underwriters Laboratories), and printed reports (current UL Listing Verification & UL 752 Test Results as provided by Underwriters Laboratories).

1.05 DESIGN PERFORMANCE

A. Through the design, manufacturing techniques and material application the TSS Bullet Resistant Aluminum Door shall be constructed of an extruded aluminum in 6061-T6 alloy/tempered. With a UL Standard 752 Level 3 protection rating. Door and frame to have no exposed fasteners, corner joints shall consist of extruded and keyed aluminum spline with continuous 3/8" diameter steel tie rod at door top and bottom rails. All joints and connections

shall be tight, providing hairline points and true alignment of adjacent members. Panels shall not be removable from threat side. Door system to be available in Right hand, left hand and reverse swings.

B. Standard door to defeat ballistic assaults from a .44 magnum superpower small arms handgun as tested with UL 752 Level 3 Standards at Underwriters Laboratories.

C. Door stiles, top rails and bottom rails will be lined with hardened steel to meet Level 4 and 5 UL standards.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least 5 years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Delivery the materials to the project with the manufacturer's UL Listed Labels intact and legible. Handle the materials with care to prevent damage. Store materials inside and under cover, stack flat and off floor. Project conditions (temperature, humidity, and ventilation) shall be within the maximum limit recommendations set by manufacturer. Do not install products that are under conditions outside these limits.

1.08 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. All materials shall be warranted against defects for a period of 1 year for the date of receipt at the project site. Certificates of manufacturer's standard limited warranty shall be provided at project completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Bullet Guard: 3963 Commerce Dr. West, Sacramento, CA 95691, 916-373-0402. Web: www.bulletguard.com.

B. Basis of Design: Total Security Solutions, Inc, 170 National Park Drive, Fowlerville, MI 48836, 800- 513-1468, Attn: Sales Department, info@tssbulletproof.com. Web: www.tssbulletproof.com .

C. North American Bullet Proof: 1144 Guadalupe Dr., Cibolo TX, 78108. 210-225-0982. Attn. Kris Tatsch. Web: www.nabulletproof.com.

D. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PRODUCT

A. Bullet Resistant Door System: Total Security Solutions Bullet Resistant Aluminum TSS-BL3-DR Bullet Resistant Door System. All joints and connections shall be tight, providing hairline joints and true alignment of adjacent members. Corner joinery shall consist of heavy duty extruded and keyed aluminum corner splines with continuous 3/8 inch diameter tie rod construction. Glazing must not be removable from the threat side of the door. Provide to dimension heights and widths indicated on the Drawings.

1. System shall be designed to defeat ballistic assaults from a .44 magnum handgun in accordance with UL 752, Level 3.
    a. Standard Aluminum Doors: Top rail and stile 2-3/4" (70 mm), Bottom rail 8-1/2" (216 mm) including glass stops. Note: 5 ¼" wide stile rails available upon request
    b. Aluminum Door and Sidelight Frames and Extrusions: 1 ¾" (44mm) x 4" (102mm), Structural section .125" thickness
    c. Standard Glazing: LP-1250 Polycarbonate/Acrylic Laminate, 1-1/4" thick, 7.7lbs/sf. UL 752, UL=3, 44 mag.
    d. Hardware: see Door Hardware Spec.

2. Door Frame Construction: Frames shall provide equal UL protection level as door, non-ricochet type, Aluminum ballistic extruded aluminum in 6061-T6 alloy, aluminum finish.
   a. Door hardware includes: HD continuous hinge, push/pull handle, mortised lock, overhead closer. Optional hardware: exit devices, electric strike plate, and custom security hardware. Shipped fabricated and ready for field installation.
   b. Sizes: 2 3/8” thick narrow stile door rails with 1 ¾” x 4” BR aluminum jamb.
3. Finish: Dark Bronze Anodized Aluminum.

PART 3 EXECUTION

3.01 PREPARATION

A. Prior to installing the bullet resistive material, the contractor shall verify that all supports have been installed as required by the contract documents and architectural drawings, and approved shop/CAD drawings, if required. Installer shall notify architect of any unsatisfactory preparation that is responsibility of another installer.

B. Clean and prepare all surfaces per manufacturers recommendations for achieving the best results for the substrate under the project conditions.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Do not begin installation until openings have been verified and surfaces properly prepared in accordance with Drawings. Install in accordance with manufacturer’s instructions and UL 752. Set all equipment plumb.

C. Drawings. Install in accordance with manufacturer’s instructions and UL 752. Set all equipment plumb.

D. Install plumb, level, square, true to line, and without warp or rack. Provide all fasteners required for installation. Anchor frames securely in place to supports. Use attachment methods permitting adjustment for construction tolerances, irregularities, alignment, and expansion and contraction. Separate aluminum from other metal surfaces with bituminous coatings or other means approved by Architect. Sheet Metal Flashing: Coordinate with sheet metal flashing as specified in Section 07 62 00. Joint Sealants: Install joint sealants as specified in Section 07 92 00.

3.03 POST APPLICATION

3.04 CLEANING

A. Verify installation is complete and complies with manufacturer’s requirements. Clean product and accessories, removing excess sealant, labels and protective covers.

B. Touch-up, repair or replace damaged products before Substantial Completion.

3.05 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

B. Product Warranty: Applicable warranty shall be issued to owner upon final release of completed project.

END OF SECTION 08 43 16

This page intentionally left blank

SECTION 08 56 19
INTERIOR SLIDING PASS WINDOWS

PART 1 – GENERAL

1.01 SUMMARY

A. This section includes:
   1. Frameless interior pass-thru sliding service windows as indicated in drawings and in sections.

1.02 RELATED REQUIREMENTS

A. Countertop Construction: Section 12 36 00 - Countertops.

B. Glass and Glazing: Section 08 80 00, Glazing.

1.03 SUBMITTALS

A. Submittal Procedures: Section 01 30 00, Administrative Procedures.

B. Shop Drawings: Submit for fabrication and installation of windows. Include details, elevations and installation requirement of finish hardware and cleaning.

C. Product Data: Submit Manufacturer's technical product data substantiating that products comply, and installation instructions.

D. Samples: Exposed finishes. 4" (102 mm) piece of each color.

E. Sustainable Construction Submittals: Recycled content. Identify post-consumer and pre-consumer recycled content percentage by weight.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver windows crated to provide protection during transit and job storage.

B. Inspect windows upon delivery for damage. Unless minor defects can be made to meet the Architect's specifications and satisfaction, damaged parts should be removed and replaced.

C. Store windows at building site under cover in dry location.

D. Protect products from damage during handling and construction operations.

1.05 WARRANTY

A. Warranty: All material and workmanship shall be warranted against defects for a period of one (1) year from the original date of purchase.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Header: Shall be constructed of 6063-T5 extruded aluminum. Window rolls on top-hung ball bearing rollers. Overall size is to be in accordance with the contract drawings.

B. Finish: All aluminum to be brite anodized, satin anodized, or bronze anodized (Specify).

C. Glazing: The glazing is to be ¼" (6 mm) in thickness.

D. Options: Keyed lock, push button lock, fixed sidelite header insert, recessed bottom track.

E. Models: Sharyn (OX), (XO), and (XX). X = sliding panel, O = fixed panel, as viewed from clerks side.

2.02 PRODUCTS GENERAL

A. Basis of design: Design is based on Sharyn Series Frameless Interior Pass-Thru Window manufactured by:
   1. R. Laurence Co., Inc. (800) 421-6144 Ext. 7760
   2. transaction@crlaurence.com

B. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 PASS WINDOWS

1. Pass Window Units: Factory fabricated, glazed unit; horizontal sliding type.
   a. Header: Extruded aluminum.
   b. Glass: Safety type specified in Section 08 80 00, Glazing.
   c. Hardware: Manufacturer's standard double track header, rollers, guides, push button lock.

PART 3 – EXECUTION

3.01 PREPARATION

A. Examine and verify substrate suitability for product installation.

B. Verify rough opening is properly sized and located.

C. Protect existing construction and completed work from damage.

D. Apply barrier coating to aluminum surfaces in contact with dissimilar metals and cementitious materials to minimum 0.7 mm (30 mils) dry film thickness.

3.02 INSTALLATION

A. Install window in accordance with manufacturer's printed instructions and recommendations. Repair damaged units as directed (if approved by the manufacturer and the architect) or replace with new units.

3.03 CLEANING

A. Clean frame and glazing surfaces after installation, complying with requirements contained in the manufacturer's instructions. Remove excess glazing sealant compounds, dirt or other substances.

3.04 PROTECTION

A. Institute protective measures required throughout the remainder of the construction period to ensure that all the windows do not incur any damage or deterioration, other than normal weathering, at the time of acceptance.

END OF SECTION 08 56 19

SECTION 08 56 53
BULLET RESISTANT ALUMINUM WINDOWS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Bullet resistant windows (W04), with Bullet Resistant glass-clad polycarbonate mirror glazing.

1.02 RELATED REQUIREMENTS

A. Section 07 92 00 - Joint Sealants: Sealing joints between frames and adjacent construction.

B. Section 08 11 13 - Hollow Metal Doors and Frames: Interior, non-ballistic- and non-forced-entry-rated steel windows.

C. Section 09 21 16 - Gypsum Board Assemblies: Bullet-resistant sheathing and wallboard for bullet-resistant partitions and walls.

D. Section 09 91 23 - Interior Painting: Field painting.

E. Section 13 07 00 - Bullet Resistant Fiberglass Armor Panels: bullet resistant wall assembly construction.

1.03 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum 2014 (2015 Errata).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Furnish anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, to be embedded into concrete or masonry, with setting diagrams and installation, to applicable installer in time for installation.

B. Preinstallation Meeting: Prior to start of installation arrange a meeting on site to familiarize installer and installers of related work with requirements relating to this work.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's published data showing materials, construction details, dimensions of components, and finishes.

C. Shop Drawings: Drawings prepared specifically for this project, showing plans, elevations, sections, details of construction, anchorage to other work, hardware, and glazing.
   1. For existing openings show verified field dimensions.
   2. For new work show required opening dimensions and allowance for field deviation.
   3. For field glazed windows, include detailed instructions for glazing installation.

D. Coordination Drawings: For each window opening, show locations and details of items necessary to anchor windows that must be installed by others, in sufficient detail that installer of those items can do so correctly without reference to the actual window itself.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Firm with at least 5 years experience in the manufacture of windows of the type specified and able to provide test reports showing that their standard manufactured products meet the specified requirements; custom designed products not acceptable.

B. Testing Agency Qualifications: Independent testing agency able to show experience in conducting tests of the type specified and:

C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide manufacturer's warranty agreeing to repair or replace windows and window components that fail within one year after Date of Substantial Completion due to, but not limited to, the following:
   1. Structural failure, failure of welds, and deterioration of metals and finishes beyond that expected under detention use and normal weathering.
   2. Failure of glazing due to excessive deflection of supporting members under wind load.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Security View Windows:
   1. Basis of Design: Bullet Guard: www.bulletguard.com.
   2. Chicago Bullet Proof Systems: www.chicagobulletproof.com/#sle.
   3. National Bullet Proof, Inc: www.nationalbulletproof.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Provide windows from a single manufacturer.

2.02 ASSEMBLIES

A. Security Windows:
   1. Dimensions, profiles, features, and performance specified and indicated on drawings are required; do not deviate unless specifically approved by Architect under substitution procedures specified in Section 01 60 00.
   2. Design to fit openings indicated on drawings; design to accommodate deviation of actual construction from dimensions indicated on drawings.
   3. Fabricate frames and sash with corners mitered or coped full depth with concealed welded joints.
   4. Design anchorages to provide performance equivalent to that required for window unit; provide anchorages at least equivalent to those by which the tested units were anchored to the test frame.
   5. Label units to indicate which side is which, such as inside/outside or secure/non-secure; use labels that are removable after installation but durable enough not to be lost during delivery, storage, handling, and installation.

2.03 SECURITY VIEW WINDOWS

A. Security View Windows: Factory-assembled fixed glazing panel reglazable from secure side without disassembly of frame, with non-removable trim and glazing stops on non-secure side (outside); glazing slanted outward at 5 degrees from sill to head.

B. Design to fit openings indicated on drawings; design to accommodate deviation of actual construction from dimensions indicated on drawings.

C. Dimensions, profiles, features, and performance specified and indicated on drawings are required; do not deviate unless specifically approved by Architect under substitution procedures specified in Section01 60 00.
   1. Factory glazed.

D. Design anchorages to provide performance equivalent to that required for window unit; provide anchorages at least equivalent to those by which the tested units were anchored to the test frame.
   1. Framing and Glazing Stops: Formed aluminum-clad steel sheet; color anodized finish.
   2. Ballistic Resistance: UL 752 Level 3 (super-power handgun).

E. Frames: to be deep capture with a minimum deep capture of one inch on all four sides of the window. Frames to be specifically extruded to allow all fasteners to be applied to the protected side of the frame. Frames to be made of 6063 Aluminum Alloy with a minimum wall thickness of .125”.

F. Glazing: Bullet Resistant glass-clad polycarbonate mirror glazing.
   1. Manufacturer: Global Security Glazing or equal.

2. Product: UL Level 3 - Secur-Tem + Ply with 1/4" Mirropane #1.
3. Product Code: SP311 Mod.
4. Performance Testing: UL 752 - Level 3 - UL Listed. No Spall, no penetration.
5. Thickness: 1.072" nominal.
6. Weight: 12.81 lbs / sf.
7. Factory glazed.
8. Installation: glass must be installed in a UL Level 3 Bullet Resistant Frame system. Holes must be covered with a UL listed device.

2.04 FINISHES

A. Class II Color Anodized Finish: AAMA 611 AA-M12C22A34 Electrolytically deposited colored anodic coating not less than 0.4 mils thick.

B. Color: As selected by Architect from manufacturer's standard range.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that window openings are ready for installation of windows.

B. Notify Architect if conditions are not suitable for installation of windows; do not proceed until conditions are satisfactory.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions and drawing details.

B. Install windows in correct orientation (inside/outside or secure/non-secure).

C. Anchor windows securely in manner so as to achieve performance specified.

D. Set sill members and sill flashing in continuous bead of sealant.

E.

3.03 ADJUSTING

A. Adjust operating components for smooth operation while also providing tight fit at contact points and a secure enclosure; lubricate operating hardware.

3.04 CLEANING

A. Clean exposed surfaces promptly after installation without damaging finishes.

B. Remove and replace defective work.

END OF SECTION 08 56 53

This page intentionally left blank

SECTION 08 56 60
BULLET RESISTANT TRANSACTION WINDOW ASSEMBLY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Bullet Resistant transaction window assemblies (W09).

1.02 REFERENCE

A. Underwriters Laboratory UL 752-Standard for Bullet Resisting Equipment & ASTM E119-98-Standard Test Methods for Fire Tests of Building Construction and Materials, NIJ Standard 0108.01-(National Institute of Justice) Standard for Ballistic Resistant Protective Materials, ASTM B 209/B 209M- Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate, ASTM A 666-Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar..

1.03 RELATED REQUIREMENTS

A. Section 01 10 00 - Summary: Contract descriptions, description of alterations work, work by others, future work, occupancy conditions, use of site and premises, work sequence.

B. Section 01 30 00 - Administrative Requirements: Submittal procedures, project meetings, progress schedules and documentation, reports, coordination.

C. Section 01 40 00 - Quality Requirements: Procedures for testing, inspection, mock-ups, reports, certificates; use of reference standards.

D. Section 01 78 00 - Closeout Submittals: Project record documents, operation and maintenance (O&M) data, warranties and bonds.

E. Section 09 21 16 - Gypsum Board Assemblies: Bullet-resistant sheathing and wallboard for bullet-resistant partitions and walls.

F. Section 09 91 23 - Interior Painting: Field painting.

G. Section 13 07 00 - Bullet Resistant Fiberglass Armor Panels: bullet resistant wall assembly construction.

1.04 SUBMITTALS

A. The following shall be submitted by the manufacturer in accordance with Sections 13070 and any Special Contract Requirements and coordinate with Sections 01340: Submit for approval prior to fabrication: samples, product data (including preparation, storage and installation methods), cuts & anchor spacing, reinforcement & location , product specifications, shop drawings, test reports (current UL Listing Verification & UL 752 Test Results as provided by Underwriters Laboratories), and printed data in sufficient detail to indicate compliance with the contract documents.

B. Manufacturer’s Instructions for installation and cleaning of Baffle Transaction Window Assemblies. All required submittals shall be approved prior to installation.

1.05 DESIGN PERFORMANCE

A. Through the design, manufacturing techniques and material application the TSS Baffle Transaction Window shall be of the “non-ricochet” type. This design is intended to permit the encapture and retention of an attacking projectile lessening the potential of a random injury or lateral penetration. This assembly shall provide single or multiple transaction positions utilizing the “natural voice” baffle configuration. This design shall employ offset vertical standing vision panels and 5” baffles to complete the “natural voice” design as well as to protect against angled ballistic penetrations. Each transaction position shall have a stainless-steel dip tray as shown on the drawings. Components must be manufactured in strict accordance with the specifications, design and details. All vision panels and baffles shall be cut to size with all exposed edges polished. Necessary holes shall be pre-drilled and tapped where required. Stainless Steel assembly screws and acrylic spacers shall be provided. Clear anodized angles and channels shall be provided in field lengths. Anchor screws shall be provided by the

installer.

B. No field alterations to the construction of the units fabricated under the acceptable standards shall be allowed unless approved by the manufacturer and the architect. Standard manufacturing tolerances shall be +/- 1/16".

C. Materials shall meet or exceed UL 752 requirements.

1.06 QUALITY ASSURANCE

A. Manufacturer shall be a Company that specializes in manufacturing products of the specified type with a minimum of five years experience. Installer shall be a Company that specializes in product type specified and Certified for the installation by the manufacturer. Manufacturer shall provide a Mock-up, if required, for evaluation of surface preparation and application workmanship and color/finish to the Architect for approval prior to start of work.

1.07 DELIVERY, STORAGE & HANDLING

A. Handle the materials with care to prevent damage. Store materials inside and under cover, stack flat and off floor. Project conditions (temperature, humidity, and ventilation) shall be within the maximum limit recommendations set by manufacturer. Do not install products that are under conditions outside these limits.

1.08 WARRANTY

A. All materials shall be warranted against defects for a period of 1 year for the date of receipt at the project site. Certificates of manufacturer's standard limited warranty shall be provided at project completion.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Total Security Solutions, Inc, 170 National Park Drive, Fowlerville, MI 48836, 800- 513-1468, Attn: Sales Department, info@tssbulletproof.com. Web: www.tssbulletproof.com .

B. North American Bullet Proof: 1144 Guadalupe Dr., Cibolo TX, 78108. 210-225-0982. Attn. Kris Tatsch. Web: www.nabulletproof.com.

C. Basis of Design: Bullet Guard: 3963 Commerce Dr. West, Sacramento, CA 95691, 916-373-0402. Web: www.bulletguard.com.

D. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 BULLET RESISTANT GLAZING PANELS-BAFFLES

A. Product shall be: TSS Baffle Transaction Window: The Baffle Window System consists of custom prefabricated bullet resistant panels with secure air passage as required for voice transmission. Aluminum frame, with a plastic laminate base and recessed cash tray. All accessories for installation are included. Available finishes include clear anodized or powder coated.

B. Glazing Panels shall be:
   1. Bullet-Resisting Glazing Material Options: Bullet Resistant Level 3
      a. 1/4" LP 1250 Laminated
      b. TSS 003 L/S

C. Cash tray: Brushed Stainless Steel Counter Mounted or Recessed
   1. Cash tray to be 18 ga. stainless steel, # 4 finish, 16" x 10" from the outside edge of flanges with a clear opening.

D. Provide a shelf 1 1/2" thick with a recessed cash tray. The shelf to be full width of window, 18" deep, centered under the glazing and covered with a black high-pressure laminate. (Optional stainless steel 18 ga. #4 finish).

E. Aluminum sections to be manufactured in accordance with ASTM B209, Extruded aluminum alloy 6063 T5 Anodized or powder coated finish to match the existing décor and be free of sharp edges or burrs when in place. Glazing Channel: U-Channel specifically designed for

securing transparencies tightly in place. Angles and stops are only acceptable for top attachment.

1. Frame to be anodized aluminum. The bottom of the glazing to be capped with corresponding material on the frame (ie: stainless steel on stainless steel).

PART 3 EXECUTION

3.01 PREPARATION

A. Prior to installing the bullet resistive material, the contractor shall verify that all supports have been installed as required by the contract documents and architectural drawings, and approved shop/CAD drawings, if required. Installer shall notify architect of any unsatisfactory preparation that is responsibility of another installer.

B. Clean and prepare all surfaces per manufacturers recommendations for achieving the best results for the substrate under the project conditions.

3.02 INSTALLATION

A. Do not begin installation until openings have been verified and surfaces properly prepared in accordance with Drawings. Install in accordance with manufacturer's instructions and UL 752. Set all equipment plumb. All product shall be installed per installation instructions provided by Total Security Solutions, if warranty is to be issued.

B. TSS Baffle Transaction Window shall arrive on site as a completed unit. Unit shall be installed in provided opening (wall/door), secured to structure.

3.03 POST APPLICATION

A. TSS Baffle Transaction Window shall be installed in accordance with manufacturer's printed recommendations, including adhering to anchoring and finishing details.

B. Inspection and Cleaning: Verify installation is complete and complies with manufacturer's requirements. Clean product and accessories, removing excess sealant, labels and protective covers.

C. Touch-up, repair or replace damaged products before Substantial Completion.

D. Product Warranty: Applicable warranty shall be issued to owner upon final release of completed project.

END OF SECTION 08 56 60

This page intentionally left blank

SECTION 08 70 00
DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes commercial door hardware for the following:
   1. Swinging doors.
   2. Sliding doors.
   3. Other doors to the extent indicated.

B. Door hardware includes, but is not necessarily limited to, the following:
   1. Mechanical door hardware.
   2. Electromechanical door hardware.
   3. Automatic operators.

C. Related Sections:
   1. Division 08 Section “Hollow Metal Doors and Frames”.
   2. Division 08 Section “Flush Wood Doors”.
   3. Division 08 Section “Aluminum-Framed Entrances and Storefronts”.
   4. Division 28 Section “Access Control Hardware Devices”.

D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
   1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
   2. ICC/IBC - International Building Code.
   3. NFPA 70 - National Electrical Code.
   4. NFPA 80 - Fire Doors and Windows.
   5. NFPA 101 - Life Safety Code.
   6. NFPA 105 - Installation of Smoke Door Assemblies.
   7. State Building Codes, Local Amendments.

1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
3. Content: Include the following information:
    a. Type, style, function, size, label, hand, and finish of each door hardware item.
    b. Manufacturer of each item.
    c. Fastenings and other pertinent information.
    d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
    e. Explanation of abbreviations, symbols, and codes contained in schedule.
    f. Mounting locations for door hardware.
    g. Door and frame sizes and materials.
    h. Warranty information for each product.
4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

C. Shop Drawings: Details of electrified access control hardware indicating the following:
1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:
    a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
    b. Complete (risers, point-to-point) access control system block wiring diagrams.
    c. Wiring instructions for each electronic component scheduled herein.
2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.

D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

E. Informational Submittals:
1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

F. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.

1.4 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

B. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).

C. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

D. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

E. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.

1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

F. California Building Code: Provide hardware that complies with CBC Section 11B.

1. All openings as a part of an accessible route shall comply with CBC Section 11B-404.
2. The clear opening width for a door shall be 32” minimum. For a swinging door it shall be measured between the face of the door and the stop, with the door open 90 degrees. There shall be no projections into it below 34” and 4” maximum projections into it between 34” and 80” above the finish floor or ground. Door closers and stops shall be permitted to be 78” minimum above the finish floor or ground. CBC Section 11B-404.2.3.
3. Operable hardware on accessible doors shall comply with CBC Section 11B-309.4 and shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist. Operable parts of such hardware shall be 34” minimum and 44” maximum above finish floor or ground. Where sliding doors are in the fully open position, operating hardware shall be exposed and usable from both sides.
4. Hardware (including panic hardware) shall not be provided with “nightlatch” function for any accessible doors or gates unless the following conditions are met:
    a. Such hardware has a ‘dogging’ feature and is dogged during the time the facility is open.
    b. All ‘dogging’ operation is performed only by employees as their job function (non-public use).

5. The force for pushing or pulling open a door shall be in accordance with CBC Section 11B-404.2.9.
    a. Interior hinged doors, sliding or folding doors, and exterior hinged doors: 5 pounds (22.2 N) maximum. Required fire doors: the minimum opening force allowable by the DSA authority, not to exceed 15 pounds (66.7N). These forces do not apply to the force required to retract latch bolts or disengage other devices that hold the door in a closed position.
    b. The force required for activating any operable parts, such as lever hardware, or disengaging other devices shall be 5 pounds (22.2N) maximum to comply with CBC Section 11B-309.4.
    c. The 5 pound (22.2 N) maximum force shall be validated for the size of the door used. The Building Materials Listing of the California State Fire Marshal shall indicate that the door hardware meets the 5 pound (22.2 N) force and shall also list the largest door that can be used.
6. Door closing speed shall comply with CBC Section 11B-404.2.8. Closers shall be adjusted so that the required time to move a door from an open position of 90 degrees to a position of 12 degrees from the latch is 5 seconds minimum. Spring hinges shall be adjusted so that the required time to move a door from an open position of 70 degrees to the closed position is 1.5 seconds minimum.
7. Floor stops shall not be located in the path of travel and 4” maximum from walls.
8. Thresholds shall comply with CBC Section 11B-404.2.5.

G. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.

H. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:
1. Function of building, purpose of each area and degree of security required.
2. Plans for existing and future key system expansion.
3. Requirements for key control storage and software.
4. Installation of permanent keys, cylinder cores and software.
5. Address and requirements for delivery of keys.

I. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.
1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
3. Review sequence of operation narratives for each unique access controlled opening.
4. Review and finalize construction schedule and verify availability of materials.

5. Review the required inspecting, testing, commissioning, and demonstration procedures

J. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.6 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.

C. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.7 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Electrical component defects and failures within the systems operation.

C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.

D. Special Warranty Periods:

1. Twenty five years for manual overhead door closer bodies.
2. Two years for electromechanical door hardware.

1.8 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.

B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:

1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.

C. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 HANGING DEVICES

A. Hinges: ANSI/BHMA A156.1 certified butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.

1. Quantity: Provide the following hinge quantity:
   a. Two Hinges: For doors with heights up to 60 inches.
   b. Three Hinges: For doors with heights 61 to 90 inches.
   c. Four Hinges: For doors with heights 91 to 120 inches.
   d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.
2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
   a. Widths up to 3’0”: 4-1/2” standard or heavy weight as specified.
   b. Sizes from 3’1” to 4’0”: 5” standard or heavy weight as specified.
3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
   a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
   b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.
4. Hinge Options: Comply with the following:
   a. Non-removable Pins: With the exception of electric through wire hinges, provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.

5. Manufacturers:
    a. Hager Companies (HA).
    b. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK).
    c. Stanley Hardware (ST).

2.3 POWER TRANSFER DEVICES

A. Electrified Quick Connect Transfer Hinges: Provide electrified transfer hinges with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.
    1. Manufacturers:
        a. Hager Companies (HA) - ETW-QC (# wires) Option.
        b. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - QC (# wires) Option.
        c. Stanley Hardware (ST) - C Option.

B. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.
    1. Provide one each of the following tools as part of the base bid contract:
        a. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - Electrical Connecting Kit: QC-R001.
        b. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - Connector Hand Tool: QC-R003.
    2. Manufacturers:
        a. Hager Companies (HA) - Quick Connect.
        b. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - QC-C Series.
        c. Stanley Hardware (ST) - WH Series.

2.4 CYLINDERS AND KEYING

A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.

B. Source Limitations: Obtain each type of keyed cylinder and keys from the same source manufacturer as locksets and exit devices, unless otherwise indicated.

C. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:
    1. Threaded mortise cylinders with rings and cams to suit hardware application.
    2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
    3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.

4. Tubular deadlocks and other auxiliary locks.
5. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
6. Keyway: Match Facility Restricted Keyway.

D. Interchangeable Cores: Provide small format interchangeable cores as specified, core insert, removable by use of a special key; usable with other manufacturers' cylinders.

E. Keying System: Each type of lock and cylinders to be factory keyed.
1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.
2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
3. Existing System: Field verify and key cylinders to match Owner's existing system.

F. Key Quantity: Provide the following minimum number of keys:
1. Change Keys per Cylinder: Two (2)
2. Master Keys (per Master Key Level/Group): Five (5).
3. Construction Keys (where required): Ten (10).

G. Construction Keying: Provide construction master keyed cylinders.

2.5 MECHANICAL LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed. Locksets are to be manufactured with a corrosion resistant steel case and be field-reversible for handing without disassembly of the lock body.
1. Manufacturers:
a. dormakaba Best (BE) - 45H Series.
b. Sargent Manufacturing (SA) - 8200 Series.

B. Cylindrical Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.2, Series 4000, Operational Grade 1 Certified Products Directory (CPD) listed.
1. Vertical Impact: Exceed 100 vertical impacts (20 times ANSI/BHMA A156.2 requirements).
2. Furnish with solid cast levers, standard 2 3/4” backset, and 1/2" (3/4" at rated paired openings) throw brass or stainless steel latchbolt.
3. Locks are to be non-handed and fully field reversible.
4. Manufacturers:
a. dormakaba Best (BE) - 9K Series.
b. Sargent Manufacturing (SA) - 10X Line.

2.6 ELECTROMECHANICAL LOCKING DEVICES

A. Electromechanical Cylindrical Locksets, Grade 1 (Heavy Duty): Subject to same compliance standards and requirements as mechanical cylindrical locksets, electrified locksets to be of type and design as specified below.

1. Electrified Lock Options: Where indicated in the Hardware Sets, provide electrified options including: outside door lock/unlock trim control and request-to-exit signaling. Unless otherwise indicated, provide electrified locksets standard as fail secure.
2. Manufacturers:
    a. dormakaba Best (BE) - 93K EL/EU Series.
    b. Sargent Manufacturing (SA) - 10G70/71 Series.

2.7 LOCK AND LATCH STRIKES

A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:
    1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
    2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
    3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
    4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.

B. Standards: Comply with the following:
    1. Strikes for Mortise Locks and Latches: BHMA A156.13.
    2. Strikes for Bored Locks and Latches: BHMA A156.2.
    3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
    4. Dustproof Strikes: BHMA A156.16.

2.8 ELECTRIC STRIKES

A. Standard Electric Strikes: Electric strikes tested to ANSI/BHMA A156.31, Grade 1, for use on non-rated or fire rated openings. Strikes shall be of stainless steel construction tested to a minimum of 1500 pounds of static strength and 70 foot-pounds of dynamic strength with a minimum endurance of 1 million operating cycles. Provide strikes with 12 or 24 VDC capability, fail-secure unless otherwise specified. Where specified provide latchbolt and latchbolt strike monitoring indicating both the position of the latchbolt and locked condition of the strike.
    1. Manufacturers:
        a. HES (HS) - 1500/1600 Series.

B. Surface Mounted Rim Electric Strikes: Surface mounted rim exit device electric strikes tested to ANSI/BHMA A156.31, Grade 1, and UL Listed for both Burglary Resistance and for use on fire rated door assemblies. Construction includes internally mounted solenoid with two heavy-duty, stainless steel locking mechanisms operating independently to provide tamper resistance. Strikes tested for a minimum of 500,000 operating cycles. Provide strikes with 12 or 24 VDC capability supplied standard as fail-secure unless otherwise specified. Option available for latchbolt and latchbolt strike monitoring indicating both the position of the latchbolt and locked condition of the strike. Strike requires no cutting to the jamb prior to installation.
    1. Manufacturers:
        a. HES (HS) - 9400/9500/9600/9700/9800 Series.

C. Provide electric strikes with in-line power controller and surge suppressor by the same manufacturer as the strike with the combined products having a five year warranty.

2.9 CONVENTIONAL EXIT DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
2. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer’s catalog and template book for specific requirements.
3. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
4. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
5. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.
    a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
    b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.
6. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
7. Rim Exit Devices: Exit device rails shall release with less than 5 pounds of pressure per the California Building Code.
8. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2” wide stiles.
9. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
10. Rail Sizing: Provide exit device rails factory sized for proper door width application.
11. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Exit device latch to be stainless steel, pullman type, with deadlock feature.

1. Manufacturers:
    a. Sargent Manufacturing (SA) - 80 Series.
    b. dormakaba Precision (PR) - Apex 2000 Series.

2.10 DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.
2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.
4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.

B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.

1. Manufacturers:
   a. LCN Closers (LC) - 4040 Series.
   b. Norton Door Controls (NO) - 7500 Series.

2.11 ELECTROHYDRAULIC DOOR OPERATORS

A. General: Provide low energy operators of size recommended by manufacturer for door size, weight, and movement; for condition of exposure; and for compliance with UL 325. Coordinate operator mechanisms with door operation, hinges, and activation devices.

1. Fire-Rated Doors: Provide door operators for fire-rated door assemblies that comply with NFPA 80 for fire-rated door components and are listed and labeled by a qualified testing agency.

B. Standard: Certified ANSI/BHMA A156.19.

C. Performance Requirements:

1. Opening Force if Power Fails: Not more than 15 lbf required to release a latch if provided, not more than 30 lbf required to manually set door in motion, and not more than 15 lbf required to fully open door.
2. Entrapment Protection: Not more than 15 lbf required to prevent stopped door from closing or opening.

D. Configuration: Surface mounted or in-ground as required. Door operators to control single swinging and pair of swinging doors.

E. Operation: Power opening and spring closing operation capable of meeting ANSI A117.1 accessibility guideline. Provide time delay for door to remain open before initiating closing cycle as required by ANSI/BHMA A156.19. When not in automatic mode, door operator to function as manual door closer with fully adjustable opening and closing forces, with or without electrical power.

F. Features: Operator units to have full feature adjustments for door opening and closing force and speed, backcheck, motor assist acceleration from 0 to 30 seconds, time delay, vestibule interface delay, obstruction recycle, and hold open time from 0 up to 30 seconds.

G. Provide outputs and relays on board the operator to allow for coordination of exit device latch retraction, electric strikes, magnetic locks, card readers, safety and motion sensors and specified auxiliary contacts.

H. Brackets and Reinforcements: Manufacturer's standard, fabricated from aluminum with nonferrous shims for aligning system components.

I. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. LCN Closers (LC)
2. Norton Door Controls (NO)

2.12 DOOR STOPS AND HOLDERS

A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.

B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 certified door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

1. Manufacturers:
    a. Hiawatha, Inc. (HI).
    b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
    c. Trimco (TC).

2.13 ARCHITECTURAL SEALS

A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.

1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.

1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NPFA 252, Standard Methods of Fire Tests of Door Assemblies.

D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.

E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

F. Manufacturers:

1. National Guard Products (NG).
2. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE).
3. Reese Enterprises, Inc. (RE).

2.14 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.15 FINISHES

A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
   1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
   2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
   3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
   4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

A. Field Inspection (Punch Report): Reference Division 01 Sections “Closeout Procedures”. Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.
   1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.
   2. Submit documentation of incomplete items in the following formats:
      a. PDF electronic file.
      b. Electronic formatted file integrated with the Openings Studio™ door opening management software platform.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

B. Clean adjacent surfaces soiled by door hardware installation.

C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

1. Quantities listed are for each pair of doors, or for each single door.
2. The supplier is responsible for handing and sizing all products.
3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.
4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.

3.9 Manufacturer’s Abbreviations:

1. MK - McKinney
2. PE - Pemko
3. SU - Securitron
4. RF - Rixson
5. RO - Rockwood
6. AD - Adams Rite
7. SA - SARGENT
8. VD - Von Duprin
9. BE - dormakaba Best

10. HS - HES
11. NO - Norton
12. OT - Other

Hardware Sets

Set: 1.0

Doors: 1-111B, 2-123A, 2-131B

2	Continuous Hinge	CFM_SLF-HD1 EL-CEPT	PE
1	Concealed Vert Rod Exit	5CH 55 56 72 AD8410 106 x 862	SA
1	Concealed Vert Rod Exit	5CH 55 56 AD8410 862	SA
2	Exit Device Deflector Kit	525	SA
1	Final Core	Best Patented - Match Standard	BE
2	Drop Plate	As Required	NO
2	Door Closer	CPS7500	NO
1	Threshold	Per Detail & Field Conditions x FHSL14	PE
1	Gasket	By Door Manufacturer	
2	Sweep	315_N	PE
2	Frame Harness	QC-C1500x	MK
2	Door Harness	QC-C__x (length as required)	MK
1	Power Supply	AQDx (size as reqd)	SU
1	Card Reader	By Security Contractor	

Set: 2.0

Doors: 1-101A

1	Electric Strike, rim panic	9600	HS
1	SMART Pac Bridge Rectifier	2005M3	HS
1	Automatic Opener	6061	NO
2	Actuator Switch 6" x 36"	639	NO

Set: 3.0

Doors: 2-101A, 2-111A

2	Continuous Hinge	CFM_SLF-HD1 EL-CEPT	PE
1	Concealed Vert Rod Exit	5CH 55 56 72 AD8410 106 x 862	SA
1	Concealed Vert Rod Exit	5CH 55 56 AD8410 862	SA
2	Exit Device Deflector Kit	525	SA
2	Final Core	Best Patented - Match Standard	BE
2	Conc Overhead Stop	1-x36	RF
2	Automatic Opener	D6061-36	NO
1	Threshold	Per Detail & Field Conditions x FHSL14	PE
1	Gasket	By Door Manufacturer	
2	Sweep	315_N	PE
2	Frame Harness	QC-C1500x	MK
2	Door Harness	QC-C__x (length as required)	MK
2	Actuator Switch 6" x 36"	639	NO
1	Power Supply	AQDx (size as reqd)	SU

1	Frame Stop	As Needed	OT
1	Card Reader	By Security Contractor	

Set: 4.0

Doors: 1-125A

1	Continuous Hinge	CFM_SLF-HD1 EL-CEPT	PE
1	Rim Exit Device	5CH 55 56 72 8504 862	SA
1	Exit Device Deflector Kit	525	SA
1	Final Core	Best Patented - Match Standard	BE
1	Drop Plate	As Required	NO
1	Door Closer	PR7500	NO
1	Door Stop	471 EXP	RO
1	Threshold	Per Detail & Field Conditions x FHSL14	PE
1	Gasket	By Door Manufacturer	
1	Sweep	315_N	PE
1	Frame Harness	QC-C1500x	MK
1	Door Harness	QC-C__x (length as required)	MK
1	Power Supply	AQDx (size as reqd)	SU
1	Card Reader	By Security Contractor	

Set: 5.0

Doors: 1-101C, 1-120B

1	Continuous Hinge	CFM_SLF-HD1 EL-CEPT	PE

1	Rim Exit Device	5CH 55 56 72 8504 862	SA
1	Exit Device Deflector Kit	525	SA
1	Final Core	Best Patented - Match Standard	BE
1	Drop Plate	As Required	NO
1	Door Closer	CPS7500	NO
1	Threshold	Per Detail & Field Conditions x FHSL14	PE
1	Gasket	By Door Manufacturer	
1	Sweep	315_N	PE
1	Frame Harness	QC-C1500x	MK
1	Door Harness	QC-C__x (length as required)	MK
1	Power Supply	AQDx (size as reqd)	SU
1	Card Reader	By Security Contractor	

Set: 6.0

Doors: 1-133A, 2-118A, 2-124A

1	Continuous Hinge	CFM_SLF-HD1 EL-CEPT	PE
1	Lever Operator (inside trim)	4600 (deadlatches) 03-Square	AD
1	Electrified Deadlatch	4300	AD
1	Cylinder	Best Patented - Match Standard	BE
1	Door Pull	BF157 Mtg-Type 1HD	RO
1	Drop Plate	As Required	NO
1	Door Closer	CPS7500	NO
1	Threshold	Per Detail & Field Conditions x FHSL14	PE
1	Gasket	By Door Manufacturer	

1	Sweep	315_N	PE
1	Frame Harness	QC-C1500x	MK
1	Door Harness	QC-C__x (length as required)	MK
1	Motion Sensor (Request to Exit)	XMS	SU
1	Power Supply	AQDx (size as reqd)	SU
1	Card Reader	By Security Contractor	

Set: 7.0

Doors: 1-138A

1	Continuous Hinge	CFM_SLF-HD1 EL-CEPT	PE
1	Lever Operator (inside trim)	4600 (deadlatches) 03-Square	AD
1	Electrified Deadlatch	4300	AD
1	Cylinder	Best Patented - Match Standard	BE
1	Door Pull	BF157 Mtg-Type 1HD	RO
1	Conc Overhead Stop	1-x36	RF
1	Drop Plate	As Required	NO
1	Door Closer	7500	NO
1	Threshold	Per Detail & Field Conditions x FHSL14	PE
1	Gasket	By Door Manufacturer	
1	Sweep	18100_NB	PE
1	Frame Harness	QC-C1500x	MK
1	Door Harness	QC-C__x (length as required)	MK
1	Motion Sensor (Request to Exit)	XMS	SU
1	Power Supply	AQDx (size as reqd)	SU

1	Card Reader	By Security Contractor	

Set: 8.0

Doors: 1-129A

2	Continuous Hinge	CFM_SLF-HD1	PE
1	Concealed Vert Rod Exit	5CH 72 AD8410 106 x 862	SA
1	Concealed Vert Rod Exit	5CH AD8410 862	SA
2	Exit Device Deflector Kit	525	SA
1	Final Core	Best Patented - Match Standard	BE
2	Drop Plate	As Required	NO
2	Door Closer	CPS7500	NO
1	Threshold	Per Detail & Field Conditions x FHSL14	PE
1	Gasket	By Door Manufacturer	
2	Sweep	315_N	PE

Set: 9.0

Doors: 2-126B

1	Continuous Hinge	CFM_SLF-HD1	PE
1	Storeroom Lock	72 10XG04 LL	SA
1	Final Core	Best Patented - Match Standard	BE
1	Drop Plate	As Required	NO
1	Door Closer	CPS7500	NO
1	Threshold	Per Detail & Field Conditions x FHSL14	PE

1	Gasket	By Door Manufacturer	
1	Sweep	315_N	PE

Set: 10.0

Doors: 1-600B, 2-600B

3	Hinge (heavy weight)	T4A3386	MK
1	Storeroom Lock	72 10XG04 LL	SA
1	Final Core	Best Patented - Match Standard	BE
1	Door Closer	7500	NO
1	Wall Stop	409	RO
1	Threshold	Per Detail & Field Conditions x FHSL14	PE
1	Gasket	S44D Head & Jambs	PE
1	Sweep	18100_NB	PE

Set: 11.0

Doors: 1-602A, 2-601A, 2-602A

3	Hinge, Full Mortise	TA2314	MK
1	Storeroom Lock	72 10XG04 LL	SA
1	Final Core	Best Patented - Match Standard	BE
1	Door Closer	7500	NO
1	Wall Stop	409	RO
1	Threshold	Per Detail & Field Conditions x FHSL14	PE
1	Gasket	S44D Head & Jambs	PE

1	Sweep	18100_NB	PE

Set: 12.0

Doors: 1-132C

1	Deadlatch	4510	AD
1	Lever Operator (inside trim)	4600 (deadlatches) 03-Square	AD
1	Cylinder	Best Patented - Match Standard	BE
1	Electric Strike / Wireless Reader	ES100-15LH-IPS (by Div. 28)	HS
1	Door Pull	BF157 Mtg-Type 1HD	RO
1	Balance of Hardware	Existing to Remain	OT

Notes: Remove inside pull and cylinder.

Set: 13.0

Doors: 1-122A

2	Continuous Hinge	CFM_SLF-HD1	PE
2	Concealed Vert Rod Exit, Classroom	NB 16 5CH 72 AD8413 ETL	SA
2	Exit Device Deflector Kit	525	SA
2	Final Core	Best Patented - Match Standard	BE
2	Door Closer	CPS7500	NO
1	Gasket	By Door Manufacturer	

Set: 14.0

Doors: 1-107B

1	Panic Trim	996L-NL	VD
1	Final Core	Best Patented - Match Standard	BE
1	Electric Strike, rim panic	9600	HS
1	SMART Pac Bridge Rectifier	2005M3	HS
1	Power Supply	AQDx (size as reqd)	SU
1	Balance of Hardware	Existing to Remain	OT
1	Card Reader	By Security Contractor	

Set: 15.0

Doors: 1-508A

1	Continuous Hinge	CFM_SLF-HD1	PE
1	Access Control Rim Exit	72 IN100-8877-BIPS MB ETL (by Div. 28)	SA
1	Exit Device Deflector Kit	525	SA
1	Final Core	Best Patented - Match Standard	BE
1	Drop Plate	As Required	NO
1	Door Closer	7500	NO
1	Wall Stop	409	RO
1	Gasket	By Door Manufacturer	

Notes: Requires a wide stile door.

Set: 16.0

Doors: 1-200A, 1-200B, 1-400A, 1-400B, 1-500A, 2-200A, 2-200B, 2-300A, 2-400A, 2-400B, 2-500A, 2-500B

3	Hinge, Full Mortise	TA2714	MK
1	Rim Exit Device, Passage	12 5CH 8815 ETL	SA
1	Exit Device Deflector Kit	525	SA
1	Door Closer	7500	NO
1	Wall Stop	409	RO
1	Gasket	S44D Head & Jambs	PE

Set: 16.1

Doors: 2-100A, 2-100B, 2-300B

2	Hinge (heavy weight)	T4A3786	MK
1	Electric Hinge	T4A3786 QCxx	MK
1	Fail Safe Exit Device	12 5CH 55 72 8875 ETL	SA
1	Exit Device Deflector Kit	525	SA
1	Final Core	Best Patented - Match Standard	BE
1	Door Closer	7500	NO
1	Wall Stop	409	RO
1	Gasket	S44D Head & Jambs	PE
1	Frame Harness	QC-C1500x	MK
1	Door Harness	QC-C__x (length as required)	MK
1	Power Supply	AQDx (size as reqd)	SU
1	Card Reader	By Security Contractor	

Set: 18.0

Doors: 2-205A

3	Hinge, Full Mortise	TA2714	MK
1	Rim Exit Device	12 5CH 72 8806 ETL	SA
1	Exit Device Deflector Kit	525	SA
1	Final Core	Best Patented - Match Standard	BE
1	Door Closer	7500	NO
1	Wall Stop	409	RO
1	Gasket	S44D Head & Jambs	PE

Set: 19.0

Doors: 1-130A

3	Hinge, Full Mortise	TA2714	MK
1	Rim Exit Device	12 5CH 72 8806 ETL	SA
1	Exit Device Deflector Kit	525	SA
1	Final Core	Best Patented - Match Standard	BE
1	Door Closer	CPS7500	NO
1	Gasket	S44D Head & Jambs	PE

Set: 20.0

Doors: 1-122B

8	Hinge (heavy weight)	T4A3786	MK
2	Surface Vert Rod Exit, Passage	12 NB8715 ETL	SA
2	Exit Device Deflector Kit	525	SA
2	Door Closer	7500	NO

2	Wall Stop	409	RO
1	Gasket	S773D	PE
2	Astragal	As Required By Door Mfr.	OT

Set: 20.1

Doors: 1-120C

3	Hinge (heavy weight)	T4A3786	MK
1	Rim Exit Device, Passage	12 5CH 8815 ETL	SA
1	Final Core	Best Patented - Match Standard	BE
1	Door Closer	7500	NO
1	Wall Stop	409	RO
1	Gasket	S44D Head & Jambs	PE

Set: 21.0

Doors: 1-100B

3	Hinge (heavy weight)	T4A3786	MK
1	Rim Exit Device, Classroom	12 5CH 72 8813 ETL	SA
1	Exit Device Deflector Kit	525	SA
1	Final Core	Best Patented - Match Standard	BE
1	Door Closer	7500	NO
1	Wall Stop	409	RO
1	Gasket	S44D Head & Jambs	PE

Set: 22.0

Doors: 1-422A, 1-422C

4	Hinge (heavy weight)	T4A3786	MK
1	Rim Exit Device, Classroom	5CH 72 8813 ETL	SA
1	Exit Device Deflector Kit	525	SA
1	Final Core	Best Patented - Match Standard	BE
1	Door Closer	7500	NO
1	Wall Stop	409	RO
1	Seals & Threshold	By Sound Door Mfr.	OT

Set: 23.0

Doors: 1-100A

3	Hinge (heavy weight)	T4A3786	MK
1	Rim Exit Device, Passage	12 5CH 8815 ETL	SA
1	Exit Device Deflector Kit	525	SA
1	Door Closer	7500	NO
1	Wall Stop	409	RO
1	Gasket	S44D Head & Jambs	PE

Set: 24.0

Doors: 1-115A

1	Storeroom Lock	72 10XG04 LL	SA
1	Final Core	Best Patented - Match Standard	BE
1	Electric Strike, cylindrical lock	1500C	HS

1	SMART Pac Bridge Rectifier	2005M3	HS
1	Power Supply	AQDx (size as reqd)	SU
1	Balance of Hardware	Existing to Remain	OT
1	Card Reader	By Security Contractor	

Set: 25.0

Doors: 1-117B, 1-136A, 1-139B, 2-102A, 2-103A

3	Hinge (heavy weight)	T4A3786	MK
1	Electric Hinge	T4A3786 QCxx	MK
1	Fail Secure Lock	RX 72 10G71 LL	SA
1	Final Core	Best Patented - Match Standard	BE
1	Door Closer	7500	NO
1	Wall Stop	409	RO
1	Frame Harness	QC-C1500x	MK
1	Door Harness	QC-C__x (length as required)	MK
1	Power Supply	AQDx (size as reqd)	SU
1	Seals & Threshold	By Sound Door Mfr.	OT
1	Card Reader	By Security Contractor	

Set: 26.0

Doors: 1-139A, 2-126A

3	Hinge (heavy weight)	T4A3786	MK
1	Electric Hinge	T4A3786 QCxx	MK
1	Fail Secure Lock	RX 72 10G71 LL	SA

1	Final Core	Best Patented - Match Standard	BE
1	Door Closer	7500	NO
1	Wall Stop	409	RO
1	Threshold (for auto door bottom)	151 / 236 FHSL14 (verify flooring)	PE
1	Gasket	S773D	PE
1	Door Bottom	STC411_PK / NBL (verify flooring)	PE
1	Frame Harness	QC-C1500x	MK
1	Door Harness	QC-C__x (length as required)	MK
1	Power Supply	AQDx (size as reqd)	SU
1	Card Reader	By Security Contractor	

Set: 27.0

Doors: 1-107A, 1-111A, 1-119A, 1-120A, 1-121A, 1-126A, 1-126B, 1-128A, 1-135A, 2-102B, 2-114A, 2-120A, 2-123B, 2-123B, 2-131A

2	Hinge, Full Mortise	TA2714	MK
1	Electric Hinge	TA2714 QCxx	MK
1	Fail Secure Lock	RX 72 10G71 LL	SA
1	Final Core	Best Patented - Match Standard	BE
1	Door Closer	7500	NO
1	Wall Stop	409	RO
1	Gasket	S44D Head & Jambs	PE
1	Frame Harness	QC-C1500x	MK
1	Door Harness	QC-C__x (length as required)	MK
1	Power Supply	AQDx (size as reqd)	SU
1	Card Reader	By Security Contractor	

Set: 28.0

Doors: 2-013A

6	Hinge, Full Mortise	TA2714	MK
1	Dust Proof Strike	570	RO
1	Auto Flush Bolt, top only	2840 / 2940	RO
1	Access Control Cyl Lock	72 IN100-10G77-BIPS MB LL (by Div. 28)	SA
1	Final Core	Best Patented - Match Standard	BE
1	Coordinator	2600 x FB x Mtg Brkts	RO
2	Door Closer	7500	NO
2	Wall Stop	409	RO
1	Gasket	S773D	PE
2	Door Bottom	STC411_PK / NBL (verify flooring)	PE
1	Astragal	355_V (or by door mfr)	PE

Set: 29.0

Doors: 1-240B, 1-308A, 1-321A, 1-335A, 1-535B, 1-536A, 1-536B, 1-543A, 2-226A, 2-346A, 2-408B, 2-510B

4	Hinge (heavy weight)	T4A3786	MK
1	Access Control Cyl Lock	72 IN100-10G77-BIPS MB LL (by Div. 28)	SA
1	Final Core	Best Patented - Match Standard	BE
1	Door Closer	7500	NO
1	Wall Stop	409	RO
1	Seals & Threshold	By Sound Door Mfr.	OT

Set: 29.1

Doors: 1-422B

3	Hinge (heavy weight)	T4A3786	MK
1	Access Control Rim Exit	72 IN100-8877-BIPS MB ETL (by Div. 28)	SA
1	Exit Device Deflector Kit	525	SA
1	Final Core	Best Patented - Match Standard	BE
1	Door Closer	7500	NO
1	Wall Stop	409	RO
1	Seals & Threshold	By Sound Door Mfr.	OT

Set: 30.0

Doors: 1-210A, 1-218A, 1-229A, 1-230A, 1-239A, 1-309A, 1-316A, 1-409A, 1-416A, 1-427A, 1-437A, 1-517A, 1-528A, 1-533A, 1-541A, 2-008A, 2-009A, 2-210A, 2-218A, 2-237A, 2-308A, 2-310A, 2-332A, 2-337A, 2-345A, 2-410A, 2-419A, 2-430A, 2-433A, 2-512A, 2-522A, 2-525A, 2-534A, 2-538A

3	Hinge, Full Mortise	TA2714	MK
1	Access Control Cyl Lock	72 IN100-10G77-BIPS MB LL (by Div. 28)	SA
1	Final Core	Best Patented - Match Standard	BE
1	Door Closer	7500	NO
1	Wall Stop	409	RO
1	Gasket	S44D Head & Jambs	PE

Set: 31.0

Doors: 1-134A, 1-137A, 1-225A, 1-226A, 1-334A, 1-440A, 2-002A, 2-005A, 2-011A, 2-223A, 2-226B, 2-234A, 2-346B, 2-423A, 2-426A, 2-529A

1	Access Control Cyl Lock	72 IN100-10G77-BIPS MB LL (by Div. 28)	SA
1	Final Core	Best Patented - Match Standard	BE
1	Balance of Hardware	Existing to Remain	OT

Set: 32.0

Doors: 2-017A

1	Access Control Cyl Lock	72 IN100-10G77-BIPS MB LL (by Div. 28)	SA
1	Final Core	Best Patented - Match Standard	BE
1	Door Closer	7500	NO
1	Balance of Hardware	Existing to Remain	OT

Set: 33.0

Doors: 1-326A

1	Access Control Mort Lock	72 IN100-7978-BIPS MB LNL (by Div. 28)	SA
1	Final Core	Best Patented - Match Standard	BE
1	Balance of Hardware	Existing to Remain	OT

Set: 34.0

Doors: 2-007A, 2-307A

1	Storeroom Lock	72 10XG04 LL	SA
1	Final Core	Best Patented - Match Standard	BE

1	Balance of Hardware	Existing to Remain	OT

Set: 35.0

Doors: 1-131A, 2-003A

1	Storeroom Lock	72 10XG04 LL	SA
1	Final Core	Best Patented - Match Standard	BE
1	Door Closer	7500	NO
1	Balance of Hardware	Existing to Remain	OT

Set: 36.0

Doors: 2-010A

6	Hinge, Full Mortise	TA2714	MK
1	Auto Flush Bolt Set	2842 / 2942	RO
1	Dust Proof Strike	570	RO
1	Storeroom Lock	72 10XG04 LL	SA
1	Final Core	Best Patented - Match Standard	BE
1	Coordinator	2600 x FB x Mtg Brkts	RO
2	Door Closer	7500	NO
2	Wall Stop	409	RO
2	Silencer	608	RO

Set: 37.0

Doors: 1-507A

1	Storeroom Lock	72 10XG04 LL	SA
1	Final Core	Best Patented - Match Standard	BE
1	Door Stop & Holder	491R	RO
1	Balance of Hardware	Existing to Remain	OT

Set: 38.0

Doors: 1-307A, 2-438A

3	Hinge, Full Mortise	TA2714	MK
1	Storeroom Lock	72 10XG04 LL	SA
1	Final Core	Best Patented - Match Standard	BE
1	Wall Stop	409	RO
3	Silencer	608	RO

Set: 39.0

Doors: 2-106A, 2-207A, 2-407A

3	Hinge, Full Mortise	TA2714	MK
1	Storeroom Lock	72 10XG04 LL	SA
1	Final Core	Best Patented - Match Standard	BE
1	Wall Stop	409	RO
1	Gasket	S44D Head & Jambs	PE

Set: 40.0

Doors: 1-205A, 1-235A, 1-241A, 1-405A, 1-426A, 1-505A, 2-305A, 2-310B, 2-405A, 2-505A

3	Hinge, Full Mortise	TA2714	MK
1	Storeroom Lock	72 10XG04 LL	SA
1	Final Core	Best Patented - Match Standard	BE
1	Door Closer	7500	NO
1	Wall Stop	409	RO
1	Gasket	S44D Head & Jambs	PE

Set: 41.0

Doors: 1-103A

3	Hinge, Full Mortise	TA2714	MK
1	Storeroom Lock	72 10XG04 LL	SA
1	Final Core	Best Patented - Match Standard	BE
1	Door Closer	CPS7500	NO
1	Gasket	S44D Head & Jambs	PE

Set: 42.0

Doors: 1-430A, 2-213A, 2-228A, 2-229A, 2-230A, 2-231A, 2-518A

1	Office Lock	72 10XG24 LL	SA
1	Final Core	Best Patented - Match Standard	BE
1	Gasket	S773D	PE
1	Balance of Hardware	Existing to Remain	OT

Set: 43.0

Doors: 1-231A, 1-520B, 1-530B, 2-116A

4	Hinge (heavy weight)	T4A3786	MK
1	Office Lock	72 10XG24 LL	SA
1	Final Core	Best Patented - Match Standard	BE
1	Wall Stop	409	RO
1	Seals & Threshold	By Sound Door Mfr.	OT

Set: 44.0

Doors: 1-113A, 1-114A, 1-211A, 1-222A, 1-223A, 1-232A, 1-233A, 1-234A, 1-237A, 1-311A, 1-312a, 1-313A, 1-314A, 1-315A, 1-317A, 1-318A, 1-511A, 1-512A, 1-513A, 1-514A, 1-515A, 1-516A, 1-518A, 1-519A, 1-521A, 1-523A, 1-524A, 1-538A, 1-539A, 1-540A, 2-014A, 2-129A, 2-211A, 2-216A, 2-217A, 2-222A, 2-227A, 2-235A, 2-316A, 2-322A, 2-323A, 2-324A, 2-333A, 2-334A, 2-335A, 2-336A

4	Hinge (heavy weight)	T4A3786	MK
1	Office Lock	72 10XG24 LL	SA
1	Final Core	Best Patented - Match Standard	BE
1	Wall Stop	409	RO
1	Threshold (for auto door bottom)	151 / 236 FHSL14 (verify flooring)	PE
1	Gasket	S773D	PE
1	Door Bottom	STC411_PK / NBL (verify flooring)	PE

Set: 45.0

Doors: 1-112A

4	Hinge (heavy weight)	T4A3786	MK
1	Office Lock	72 10XG24 LL	SA
1	Final Core	Best Patented - Match Standard	BE
1	Door Closer	7500	NO

1	Wall Stop	409	RO
1	Threshold (for auto door bottom)	151 / 236 FHSL14 (verify flooring)	PE
1	Gasket	S773D	PE
1	Door Bottom	STC411_PK / NBL (verify flooring)	PE

Set: 46.0

Doors: 1-132B

1	Passage Latch	10XU15 LL	SA
1	Balance of Hardware	Existing to Remain	OT

Set: 46.1

Doors: 2-204A, 2-206A

1	Passage Latch	10XU15 LL	SA
1	Gasket	S773D	PE
1	Balance of Hardware	Existing to Remain	OT

Set: 47.0

Doors: 2-510A

5	Hinge (heavy weight)	T4A3786	MK
1	Passage Latch	10XU15 LL	SA
1	Door Closer	7500	NO
1	Wall Stop	409	RO
1	Seals & Threshold	By Sound Door Mfr.	OT

Set: 48.0

Doors: 1-104A, 1-105A, 1-227A, 2-338A

3	Hinge (heavy weight)	T4A3786	MK
1	Passage Latch	10XU15 LL	SA
1	Door Closer	7500	NO
1	Wall Stop	409	RO
1	Threshold (for auto door bottom)	151 / 236 FHSL14 (verify flooring)	PE
1	Gasket	S773D	PE
1	Door Bottom	STC411_PK / NBL (verify flooring)	PE

Set: 49.0

Doors: 2-404A, 2-406A

4	Hinge, Full Mortise	TA2714	MK
1	Passage Latch	10XU15 LL	SA
1	Door Closer	7500	NO
1	Wall Stop	409	RO
1	Threshold (for auto door bottom)	151 / 236 FHSL14 (verify flooring)	PE
1	Gasket	S773D	PE
1	Door Bottom	STC411_PK / NBL (verify flooring)	PE

Set: 50.0

Doors: 1-208A, 1-428A, 2-209A, 2-232A, 2-331A, 2-421A

1	Classroom Lock	72 10XG37 LL	SA
1	Final Core	Best Patented - Match Standard	BE
1	Gasket	S773D	PE
1	Balance of Hardware	Existing to Remain	OT

Set: 51.0

Doors: 1-310A, 1-421A, 1-530A

4	Hinge (heavy weight)	T4A3786	MK
1	Classroom Lock	72 10XG37 LL	SA
1	Final Core	Best Patented - Match Standard	BE
1	Wall Stop	409	RO
1	Seals & Threshold	By Sound Door Mfr.	OT

Set: 52.0

Doors: 2-016A

4	Hinge (heavy weight)	T4A3786	MK
1	Access Control Cyl Lock	72 IN100-10G77-BIPS MB LL (by Div. 28)	SA
1	Final Core	Best Patented - Match Standard	BE
1	Door Closer	7500	NO
1	Wall Stop	409	RO
1	Threshold (for auto door bottom)	151 / 236 FHSL14 (verify flooring)	PE
1	Gasket	S773D	PE
1	Door Bottom	STC411_PK / NBL (verify flooring)	PE

Set: 53.0

Doors: 1-116A, 1-117A, 1-423A, 1-520A, 1-535A, 2-427A, 2-428A

3	Hinge (heavy weight)	T4A3786	MK
1	Classroom Lock	72 10XG37 LL	SA
1	Final Core	Best Patented - Match Standard	BE
1	Door Closer	7500	NO
1	Wall Stop	409	RO
1	Seals & Threshold	By Sound Door Mfr.	OT

Set: 53.1

Doors: 1-240A

3	Hinge, Full Mortise	TA2714	MK
1	Classroom Lock	72 10XG37 LL	SA
1	Final Core	Best Patented - Match Standard	BE
1	Door Closer	CPS7500	NO
1	Seals & Threshold	By Sound Door Mfr.	OT

Set: 54.0

Doors: 1-106A, 1-327A, 1-438A, 2-000A, 2-000B

3	Hinge, Full Mortise	TA2714	MK
1	Classroom Lock	72 10XG37 LL	SA
1	Final Core	Best Patented - Match Standard	BE
1	Door Closer	7500	NO

1	Wall Stop	409	RO
1	Gasket	S44D Head & Jambs	PE

Set: 55.0

Doors: 1-526A

1	Classroom Lock	72 10XG37 LL	SA
1	Dummy Trim	10XU94 LL	SA
1	Final Core	Best Patented - Match Standard	BE
1	Gasket	S773D	PE
1	Astragal	S772D	PE
2	Astragal	29324_NB	PE
1	Balance of Hardware	Existing to Remain	OT

Set: 56.0

Doors: 1-425A

4	Hinge (heavy weight)	T4A3786	MK
1	Privacy Lock	LB V20 8265 LNL	SA
1	Wall Stop	409	RO
1	Seals & Threshold	By Sound Door Mfr.	OT

Set: 57.0

Doors: 2-508A

3	Hinge (heavy weight)	T4A3786	MK

1	Privacy Lock	LB V20 8265 LNL	SA
1	Door Closer	7500	NO
1	Wall Stop	409	RO
1	Threshold (for auto door bottom)	151 / 236 FHSL14 (verify flooring)	PE
1	Gasket	S773D	PE
1	Door Bottom	STC411_PK / NBL (verify flooring)	PE

Set: 57.1

Doors: 2-104A, 2-105A, 2-107A, 2-108A, 2-117A, 2-119A

3	Hinge (heavy weight)	T4A3786	MK
1	Privacy Lock	LB V20 8265 LNL	SA
1	Door Closer	7500	NO
1	Wall Stop	409	RO
3	Silencer	608	RO

Set: 58.0

Doors: 2-330A

8	Hinge, Full Mortise	TA2714	MK
2	Half Dummy Trim	10XU93 LL	SA
1	Balance of Hardware	Existing to Remain	OT

Set: 59.0

Doors: 1-601A

1	Storeroom Lock	72 10XG04 LL	SA
1	Final Core	Best Patented - Match Standard	BE
1	Door Closer	7500	NO
1	Balance of Hardware	Existing to Remain	OT

Set: 60.0

Doors: 1-101B, 1-102B, 1-102C, 1-108A, 1-109A, 1-110A, 1-118A, 1-132A, 1-204A, 1-206A, 1-207A, 1-209A, 1-212A, 1-213A, 1-214A, 1-215A, 1-216A, 1-217A, 1-219A, 1-221A, 1-224A, 1-300A, 1-300B, 1-304A, 1-305A, 1-306A, 1-320A, 1-321B, 1-323A, 1-324A, 1-325A, 1-328A, 1-329A, 1-330A, 1-331A, 1-332A, 1-404A, 1-406A, 1-407A, 1-408A, 1-411A, 1-412A, 1-413A, 1-414A, 1-415A, 1-418A, 1-419A, 1-432A, 1-433A, 1-434A, 1-500B, 1-504A, 1-506A, 1-531A, 1-532A, 1-534A, 1-542A, 2-124B, 2-208A, 2-212A, 2-214A, 2-219A, 2-220A, 2-225A, 2-304A, 2-306A, 2-313A, 2-315A, 2-317A, 2-318A, 2-319A, 2-320A, 2-321A, 2-340A, 2-341A, 2-342A, 2-408A, 2-411A, 2-412A, 2-413A, 2-414A, 2-415A, 2-416A, 2-417A, 2-418A, 2-422A, 2-425A, 2-431A, 2-435A, 2-436A, 2-504A, 2-506A, 2-507A, 2-513A, 2-513B, 2-514A, 2-515A, 2-517A, 2-519A, 2-520A, 2-521A, 2-521B, 2-524A, 2-526A, 2-528A, 2-529B, 2-531A, 2-532A, 2-533A, 2-535A, 2-536A

1	Existing Hardware	To Remain	OT

Set: 62.0

Doors: MISC

44	Hub	AH20 / 30 / 40 (verify system) (by Div. 28)	SA

Notes:

1. The quantity is an estimate, depending on final card reader quantity and where these hubs can be placed throughout the building.
2. See Drawing Sheet AS-101, Gate Schedule for additional hardware not listed in this section and Enlarged Site Plan sheet AS-103 for locations.

END OF SECTION 087100

SECTION 08 80 00
GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Insulating glass units.

B. Interior float glass.

C. Glazing compounds and accessories.

1.02 RELATED REQUIREMENTS

A. Section 07 25 00 - Weather Barriers.

B. Section 07 92 00 - Joint Sealants: Sealants for other than glazing purposes.

C. Section 08 11 13 - Hollow Metal Doors and Frames: Glazed lites in doors and borrowed lites.

D. Section 08 14 16 - Flush Wood Doors: Glazed lites in doors.

E. Section 08 43 16 - Bullet Resistant Aluminum Doors and Frames: Glazing provided as part of bullet resistant assembly.

F. Section 08 56 53 - Bullet Resistant Aluminum Windows: Glazing provided as part of security assembly.

G. Section 08 56 60 - Bullet Resistant Transaction Window Assemblies: Glazing provided as part of security assembly.

H. Section 08 87 00 - Window Film.

1.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials Current Edition.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test 2015 (Reaffirmed 2020).

C. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures Most Recent Edition Cited by Referring Code or Reference Standard.

D. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers 2005 (Reapproved 2019).

E. ASTM C1036 - Standard Specification for Flat Glass 2021.

F. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass 2018.

G. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass 2019.

H. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass 2021.

I. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings 2016.

J. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation 2010.

K. GANA (GM) - GANA Glazing Manual 2008.

L. GANA (SM) - GANA Sealant Manual 2008.

M. NFRC 100 - Procedure for Determining Fenestration Product U-factors 2017.

N. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence 2014, with Errata (2017).

O. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems 2017.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.

C. Samples: Submit 4-inch long bead of glazing sealant, color as selected by Architect.

D. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in City's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with GANA (GM) and GANA (SM) for glazing installation methods. Maintain one copy on site.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.06 FIELD CONDITIONS

A. Do not install glazing when ambient temperature is less than 40 degrees F.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Insulating Glass Units: Provide a five (5) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.

C. Laminated Glass: Provide a five (5) year manufacturer warranty to include coverage for delamination, including providing products to replace failed units.

D. Polycarbonate Sheet Glazing: Provide a five (5) year manufacturer warranty to include coverage for breakage, coating failure, abrasion resistance, including providing products to replace failed units.

E. Heat Soaked Tempered Glass: Provide a five (5) year manufacturer warranty to include coverage for spontaneous breakage of fully tempered glass caused by nickel sulfide (NiS) inclusions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Glass Fabricators:
   1. GGI - General Glass International: www.generalglass.com/#sle.
   2. JE Berkowitz, LP: www.jeberkowitz.com/#sle.
   3. Standard Bent Glass Corp: www.standardbent.com/#sle.
   4. Trulite Glass & Aluminum Solutions, LLC: www.trulite.com/#sle.
   5. Viracon, Inc: www.viracon.com/#sle.
   6. Substitutions: See Section 01 60 00 - Product Requirements.

B. Float Glass Manufacturers:
   1. AGC Glass North America, Inc: www.agcglass.com/#sle.
   2. Cardinal Glass Industries: www.cardinalcorp.com/#sle.
   3. Guardian Glass, LLC: www.guardianglass.com/#sle.
   4. Pilkington North America Inc: www.pilkington.com/na/#sle.
   5. Vitro Architectural Glass (formerly PPG Glass): www.vitroglazings.com/#sle.
   6. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.

1. Design Pressure: Calculated in accordance with ASCE 7.
2. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
3. Seismic Loads: Design and size glazing components to withstand seismic loads and sway displacement in accordance with the requirements of ASCE 7
4. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
5. Glass thicknesses listed are minimum.

B. Vapor Retarder and Air Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure vapor retarder and air barrier.
   1. In conjunction with vapor retarder and joint sealer materials described in other sections.
      a. Refer to Section 07 25 00.
   2. To utilize the inner pane of multiple pane insulating glass units for the continuity of the vapor retarder and air barrier seal.
   3. To maintain a continuous vapor retarder and air barrier throughout the glazed assembly from glass pane to heel bead of glazing sealant.

C. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:
   1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
   2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
   3. Solar Optical Properties: Comply with NFRC 300 test method.

2.03 GLASS MATERIALS

A. Float Glass: Provide float glass based glazing unless otherwise indicated.
   1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality - Q3.
   2. Kind HS - Heat-Strengthened Type: Complies with ASTM C1048.
   3. Kind FT - Fully Tempered Type: Complies with ASTM C1048.
   4. Fully Tempered Safety Glass: Complies with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.
   5. Heat-Soak Testing (HST): Provide HST of fully tempered glass used on canopy, point-supported, spider wall, high-risk, sloping overhead, horizontal overhead, free-standing glass protective barrier, or other demanding applications of project, to reduce risks of spontaneous breakage due to nickel sulfide (NiS) induced fractures in accordance with industry established testing requirements.
   6. Impact Resistant Safety Glass: Complies with ANSI Z97.1 - Class B, or 16 CFR 1201 - Category I criteria.
   7. Tinted Type: ASTM C1036, Class 2 - Tinted, Quality - Q3, with color and performance characteristics as indicated.
   8. Patterned Glass Type: ASTM C1036, Type II - Patterned Flat Glass, Quality - Q5, Form 3 - Patterned glass, with color and performance characteristics as indicated.
   9. Wired Glass Type: ASTM C1036, Type II - Wired Flat Glass, Quality - Q6, with color and performance characteristics as indicated.
   10. Safety Wired Glass Type: ASTM C1036, Type II - Wired Flat Glass, Quality - Q5, complying with ANSI Z97.1 - Class B, or 16 CFR 1201 - Category I impact test requirements, and with color and performance characteristics as indicated.
   11. Thicknesses: As indicated; provide greater thickness as required for exterior glazing wind load design.

B. Laminated Glass: Float glass laminated in accordance with ASTM C1172.
   1. Laminated Safety Glass: Complies with ANSI Z97.1 - Class B or 16 CFR 1201 - Category I impact test requirements.

2.04 INSULATING GLASS UNITS

A. Manufacturers:
   1. Glass: Any of the manufacturers specified for float glass.
   2. Fabricator certified by glass manufacturer for type of glass, coating, and treatment involved and capable of providing specified warranty.
   3. Substitutions: See Section 01 60 00 - Product Requirements.

B. Insulating Glass Units: Types as indicated.
   1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
   2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
   3. Metal Edge Spacers: Aluminum, bent and soldered corners.
   4. Spacer Color: Black.
   5. Edge Seal:
      a. Dual-Sealed System: Provide polyisobutylene sealant as primary seal applied between spacer and glass panes, and silicone, polysulfide, or polyurethane sealant as secondary seal applied around perimeter.
      b. Color: Black.
   6. Purge interpane space with dry air, hermetically sealed.
   7. Capillary Tubes: Provide tubes from air space for insulating glass units without inert type gas that have a change of altitude greater than 2500 feet between point of fabrication and point of installation to permit pressure equalization of air space.
      a. Capillary Tubes: Tubes to remain open and be of length and material type in accordance with insulating glass fabricator's requirements.
      b. Inert gas may be installed in the field into air space in accordance with insulating glass fabricator's and installer's requirements.

2.05 BASIS OF DESIGN - INSULATING GLASS UNITS

A. Basis of Design - Insulating Glass Units: Vision glazing, with low-e coating.
   1. Applications: Exterior insulating glass glazing unless otherwise indicated.
   2. Space between lites filled with air.
   3. Total Thickness: 1 inch.
   4. Glazing Method: Dry glazing method, gasket glazing.
   5. Performance: Glazing shall meet requirements cited in the Title 24 submittal.
   6. Durability: Certified by an independent testing agency to comply with ASTM E2190.
   7. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
   8. Metal Edge Spacers: Aluminum, bent and soldered corners.
   9. Spacer Color: Black.
   10. Edge Seal:
      a. Dual-Sealed System: Provide polyisobutylene sealant as primary seal applied between spacer and glass panes, and silicone, polysulfide, or polyurethane sealant as secondary seal applied around perimeter.
   11. Color: Black.
   12. Purge interpane space with dry air, hermetically sealed.
   13. Capillary Tubes: Provide tubes from air space for insulating glass units without inert type gas that have a change of altitude greater than 2500 feet between point of fabrication and point of installation to permit pressure equalization of air space.
      a. Capillary Tubes: Tubes to remain open and be of length and material type in accordance with insulating glass fabricator's requirements.
      b. Inert gas may be installed in the field into air space in accordance with insulating glass fabricator's and installer's requirements.

14. Other Manufacturers: Not permitted; provide the product identified as "Basis of Design".

2.06 ACCESSORIES

A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch by width of glazing rabbet space minus 1/16 inch by height to suit glazing method and pane weight and area.

B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Continuous by one half the height of the glazing stop by thickness to suit application, self adhesive on one face.

C. Glazing Tape, Back Bedding Mastic Type: Preformed, butyl-based, 100 percent solids compound with integral resilient spacer rod applicable to application indicated; 5 to 30 cured Shore A durometer hardness; coiled on release paper; black color.

D. Glazing Splines: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.

2.07 SOURCE QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Provide shop inspection for all fire rated and ballistic rated glazing.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.

B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

3.02 PREPARATION

A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.03 INSTALLATION, GENERAL

3.04 INSTALLATION - DRY GLAZING METHOD (GASKET GLAZING)

A. Application - Exterior and/or Interior Glazed: Set glazing infills from either the exterior or the interior of the building.

B. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.

C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.

D. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.05 INSTALLATION - DRY GLAZING METHOD (TAPE AND TAPE)

A. Application - Interior Glazed: Set glazing infills from the interior of the building.

B. Cut glazing tape to length and set against permanent stops, projecting 1/16 inch above sight line.

C. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.

D. Rest glazing on setting blocks and push against tape for full contact at perimeter of pane or unit.

E. Place glazing tape on free perimeter of glazing in same manner described above.

F. Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.

G. Carefully trim protruding tape with knife.

3.06 INSTALLATION - PLASTIC FILM

A. Install plastic film with adhesive, applied in accordance with film manufacturer's instructions.

B. Place without air bubbles, creases or visible distortion.

C. Install film tight to perimeter of glass and carefully trim film with razor sharp knife. Provide 1/16 inch to 1/8 inch gap at perimeter of glazed panel unless otherwise required. Do not score the glass.

3.07 CLEANING

A. See Section 01 74 19 - Construction Waste Management and Disposal, for additional requirements.

B. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.

C. Remove non-permanent labels immediately after glazing installation is complete.

D. Clean glass and adjacent surfaces after sealants are fully cured.

E. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.08 PROTECTION

A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION 08 80 00

SECTION 08 87 00
WINDOW FILM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sun Control Window film applied to existing and new glazing assemblies.

B. Blackout Window film applied to existing glazing assemblies.

C. New Glazing: Factory or shop install film to glazing before installation in frames.

D. Glazing assemblies to receive film are indicated on drawings.

1.02 RELATED REQUIREMENTS

A. Section 08 43 13 - Aluminum-Framed Storefronts.

B. Section 08 80 00 - Glazing: New glazing to receive film.

1.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials Current Edition.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test 2015 (Reaffirmed 2020).

C. ASTM C1184 - Standard Specification for Structural Silicone Sealants 2018, with Editorial Revision.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2021a.

E. ASTM E 308 - Standard Recommended Practice for Spectrophotometry and Description of Color in CIE 1931 System.

F. ASTM E 903 - Standard Methods of Test for Solar Absorbance, Reflectance and Transmittance of Materials Using Integrating Spheres.

G. ASTM E 903 - Standard Methods of Test for Solar Absorbance, Reflectance and Transmittance of Materials Using Integrating Spheres.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Record of product certification for safety requirements.
   2. Preparation instructions and recommendations.
   3. Storage and handling requirements and recommendations.
   4. Installation methods.

C. Shop Drawings:
   1. Existing windows shall be measured and inspected by film manufacturer for suitability of installation.
   2. Detailing installation of film, anchoring accessories, and sealant.

D. Samples: For each film product to be used, minimum size 4 inches by 6 inches, representing actual product, color, and patterns.

E. Samples, Supplemental Anchors: Where supplemental anchors are necessary to achieve specified performance submit detailed information in accordance with substitution procedures; include two samples, minimum length 2 inches.

F. Test Reports: Detailed reports of full-scale chamber tests to specified criteria, using assemblies identical to those required for this project.

G. Specimen Warranty.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Glazing film manufacturer specializing in manufacture of safety glazing films with minimum 10 years successful experience.

B. Installer Qualifications: Certified by glazing film manufacturer.All products listed in this section are to be installed by a single installer with a minimum of five years demonstrated experience in installing products of the same type and scope as specified.
   1. Provide documentation that the installer is authorized by the Manufacturer to perform Work specified in this section.
   2. Provide a commercial building reference list of 5 properties where the installer has applied window film. This list will include the following information:
      a. Name of building.
      b. The name and telephone number of a management contact.
      c. Type of glass.
      d. Type of film and/or film attachment system.
      e. Amount of film and/or film attachment system installed.
      f. Date of completion.

C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
   1. Finish areas designated by Architect.
   2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
   3. Refinish mock-up area as required to produce acceptable work.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of authorities having jurisdiction.

1.07 FIELD CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.08 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide 10 year manufacturer's replacement warranty to cover film against peeling, cracking, discoloration, and deterioration.

C. Provide warranty equal to 3M Window Films Platinum Selecdt Commercial Limited Warranty, terms of which follow:
   1. 3M Company and 3M Authorized Window Film Dealer (collectively referred to as “Seller”) agree to match the terms, conditions and limitations of your existing in force window manufacturer’s seal failure warranty with like kind on the commercial windows at the location named below to the purchaser of 3M™ Window Film for a period of thirty-six (36) months. In addition, 3M agrees to extend the length of the standard film warranty, not including labor, by an additional twenty-four (24) months. The Platinum Select Commercial Limited Warranty, heretofore termed “Warranty”, length will NOT exceed fifteen 15 years, and is not valid for exterior applied window films. 3M Company also agrees to increase the glass breakage/seal failure coverage to $2,000 per window as part of this Warranty coverage. The terms in which the Seller will cover glass breakage/seal failure is limited in scope to the terms and conditions in your standard 3M warranty.This Warranty (maximum value of $2,000 per window) applies to the glass on which 3M Window Film has been applied by an authorized 3M Window Film Dealer in accordance with factory recommended installations instructions. All filmed windows within a project must be

included for this Warranty to be valid - partial coverage is not allowed.

2. This Warranty (maximum value of $2,000 per window) applies to the glass on which 3M Window Film has been applied by an authorized 3M Window Film Dealer in accordance with factory recommended installations instructions. All filmed windows within a project must be included.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. 3M Commercial Solutions: www.solutions.3m.com/#sle.

B. Flexvue Films; if equivalent product available: www.flexvuefilms.com/#sle.

C. Madico, Inc; if equivalent product available: www.madico.com/#sle.

D. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 SUN CONTROL WINDOW FILM

A. 3M PRESTIGE 40 SUN CONTROL FILM

1. Physical Properties:
   a. Composition: Optically clear polyester film containing at least 220 layers and incorporating pressure sensitive adhesive on one side and an acrylic abrasion resistant coating on the other. Nanotechnology represents a breakthrough in technology due to the enhanced heat, UV and IR rejection, without the presence of any metals. The film does not contain dyes.
   b. Uniformity: No noticeable pin holes, streaks, thin spots, scratches, banding or other optical defects.
   c. Variation in Total Transmission across the Width: Less than 2 percent over the average at any portion along the length.
   d. Thickness: Nominal 2.0 mils (0.1 mm) with no evidence of coating voids.
   e. Identification: Labeled as to Manufacturer as listed in this Section.
2. Performance, Prestige 40 - Lightly Tinted Film, nanotechnology, no metal and at least 220 plus layers applied to 1/4 Inch (6.4 mm) Thick Clear Glass:
   a. Visible Light Transmission (NFRC 100/200): 39 percent.
   b. Visible Reflection - Exterior (NFRC 100/200): 7 percent.
   c. Visible Reflection - Interior (NFRC 100/200): 7 percent.
   d. Ultraviolet Rejected (NFRC 100/200): 99.9 percent.
   e. Infrared Energy Rejected (NFRC 100/200): Up to 97 percent; as measured between 900-1000 nm.
   f. Light to Solar Gain Ratio: 1.0.
   g. Solar Heat Gain Coefficient at 90 Degrees (Normal Incidence) (NFRC 100/200): 0.40.
   h. Total Solar Energy Rejected (TSER) at 90 Degrees (Normal Incidence) (NFRC 100/200): 60 percent.
   i. Total Solar Energy Rejected (TSER) at 60 Degrees (NFRC 100/200): 66 percent.

2.03 BLACKOUT WINDOW FILM

A. 3M SAFETY AND SECURITY BLACKOUT WINDOW FILM

1. Physical Properties:
   a. Color: Black.
   b. Visible light transmitted: 0%.
   c. Thickness: 2 mil.

2.04 MATERIALS

A. Glazing Film:film for permanent bonding to glass.

1. Thickness: 0.0020 inch, minimum.
2. Color: clear sun control film, black blackout film.

B. Accessory Materials: As recommended or required by film manufacturer.

C. Supplementary Anchors: As required by performance criteria and acceptable to Architect.

D. Structural Silicone Sealant: Self-priming, elastomeric adhesive complying with ASTM C1184.

E. Glass Cleaner: As recommended by glazing film manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Field -Applied Film: Verify that existing conditions are adequate for proper application and performance of film.

B. Confirm all glazing to receive blackout film is tempered glass.

C. Examine glass and frames. Verify that existing conditions are adequate for proper application and performance of film.

D. Verify glass is not cracked, chipped, broken, or damaged.

E. Verify that frames are securely anchored and free of defects.

F. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Mfr's representative to inspect and approve windows for film installation readiness following cleaning by Contractor.

B. Clean glass of dust, dirt, paint, oil, grease, mildew, mold, and other contaminants that would inhibit adhesion.

C. Immediately prior to applying film, thoroughly wash glass with neutral cleaning solution.

D. Protect adjacent surfaces.

E. Do not begin installation until substrates have been properly prepared.

3.03 INSTALLATION

A. Do not apply glazing film when surface temperature is less that 40 degrees F or if precipitation is imminent.

B. Install in accordance with manufacturer's instructions, without air bubbles, wrinkles, streaks, bands, thin spots, pinholes, or gaps, as required to achieve specified performance.

C. Remove any existing window film prior to cleaning glass to receive new window film.

D. Accurately cut film with straight edges to required sizes allowing 1/16 inch to 1/8 inch gap at perimeter of glazed panel unless otherwise required by anchorage method, except at blackout film there shall be no gap which admits light.

E. Seams: Seam film only as required to accommodate material sizes; form seams vertically without overlaps and gaps; do not install with horizontal seams.

F. Clean glass and anchoring accessories following installation. Remove excess sealants and other glazing materials from adjacent finished surfaces.

G. Remove labels and protective covers.

3.04 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

C. After application of film, wash film using common window cleaning solutions, including ammonia solutions, 30 days after application. Do not use abrasive type cleaning agents and bristle brushes to avoid scratching film. Use synthetic sponges or soft cloths.

END OF SECTION 08 87 00

SECTION 08 91 00
LOUVERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Louvers, frames, and accessories.

1.02 RELATED REQUIREMENTS

A. Section 07 62 00 - Sheet Metal Flashing and Trim.

B. Section 07 92 00 - Joint Sealants: Sealing joints between frames and adjacent construction.

C. Section 09 91 13 - Exterior Painting: Field painting.

D. Section 23 31 00 - HVAC Ducts and Casings: Ductwork attachment to louvers.

1.03 REFERENCE STANDARDS

A. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix) 2017a.

B. AMCA 511 - Certified Ratings Program Product Rating Manual for Air Control Devices 2021.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data describing design characteristics, maximum recommended air velocity, design free area, materials and finishes.

C. Shop Drawings: Indicate louver layout plan and elevations, opening and clearance dimensions, and tolerances; head, jamb and sill details; blade configuration, screens, blank-off areas required, and frames.

D. Samples: Submit two samples 2 by 2 inches in size illustrating finish and color of exterior and interior surfaces.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with minimum three years of documented experience.

1.06 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer's warranty against distortion, metal degradation, and connection failures of louver components.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Louvers:
   1. Airolite Company, LLC: www.airolite.com/#sle.
   2. Reliable Louvers: www.reliablelouvers.com.
   3. Airline Louvers: www.airlinelouvers.com/#sle.
   4. American Warming and Ventilating: www.awv.com/#sle.
   5. Construction Specialties, Inc: www.c-sgroup.com/#sle.
   6. Ruskin: www.ruskin.com/#sle.
   7. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 LOUVERS

A. Louvers: Factory fabricated and assembled, complete with frame, mullions, and accessories; AMCA Certified in accordance with AMCA 511.
   1. Drainable Blades: Continuous rain stop at front or rear of blade aligned with vertical gutter recessed into both jambs of frame.

B. Barometric Louvers at exterior rooftop doors to stairwells.
   1. Basis of Design: Reliable Model 445RBED Automatic Exhaust Dual Combination Louver Damper.
   2. Size: 24" x 24".
   3. Trim: Provide 2 1/4" plant-on trim to make door openings 4-inch deep to receive louver.
      a. Use metal studs or angle steel for plant-on trim on interior side of doors; paint to match louver color.
   4. Color: Black.

C. Stationary Louversat exterior walls: drainable blade, galvanized steel construction.
   1. Blades: 20 gauge steel stationary blade.
      a. Blade angle: 43 degree.
      b. Percent free area: 44%.
   2. Frame: 4 inches deep, channel profile; corner joints mitered and , with continuous recessed caulking channel each side.
   3. Steel Thickness, Galvanized: Frame 16 gauge, 0.0598 inch minimum base metal; blades 16 gauge, 0.0598 inch minimum base metal.
   4. Steel Finish: Superior performing organic coating, factory finished.
   5. Color: as selected by architect from standard range of colors.
   6. Size: as required to meet mechanical requirements, or, absent that, as shown in drawings.
   7. Accessories:
      a. Bird screen.
      b. Extended sill.
   8. Products:
      a. Airolite: Model 6774.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

D. Stationary Louversat mechanical enclosures @ mechanical enclosures: drainable blade, construction.
   1. Blades: V-shaped, 3 inch by 3 inch legs.
      a. Material: 20 gauge galvanized steel.
      b. Blade angle: 43 degree.
      c. Percent free area: 51%.
      d. Blades: stationary with drainable gutters.
      e. Spacing: 5.5 inches on center.
   2. Frame: 6 inches deep, angle profile; corner joints mitered.
      a. Material: 16 gauge galvanized steel.
   3. Steel Finish: Superior performing organic coating, factory finished.
   4. Color: as selected by architect from standard range of colors.
   5. Size: as required to meet mechanical requirements, or, absent that, as shown in drawings.
   6. Products:
      a. Airolite: Model 6776.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 MATERIALS

A. Steel Sheet: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G90/Z275 coating.

2.04 FINISHES

A. Pigmented Organic Coatings: AAMA 2603; pre-finished polyester or acrylic baked enamel finish.

2.05 ACCESSORIES

A. Flashings: Of same material as louver frame, formed to required shape, single length in one piece per location.

B. Sealant for Setting Sills and Sill Flashing: Non-curing butyl type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that prepared openings and flashings are ready to receive this work and opening dimensions are as indicated on shop drawings.

3.02 INSTALLATION

A. Install louver assembly in accordance with manufacturer's instructions.

B. Install louvers level and plumb.

C. Install flashings and align louver assembly to ensure moisture shed from flashings and diversion of moisture to exterior.

D. Secure louver frames in openings with concealed fasteners.

3.03 ADJUSTING

A. Adjust operable louvers for freedom of movement of control mechanism. Lubricate operating joints.

3.04 CLEANING

A. Strip protective finish coverings.

B. Clean surfaces and components.

END OF SECTION 08 91 00

This page intentionally left blank

SECTION 09 05 61
COMMON WORK RESULTS FOR FLOORING PREPARATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This section applies to floors identified in Contract Documents that are receiving the following types of floor coverings:
   1. Resilient tile and sheet.
   2. Thin-set ceramic tile and stone tile.

B. Removal of existing floor coverings.

C. Preparation of new and existing concrete floor slabs for installation of floor coverings.

D. Testing of concrete floor slabs for moisture and alkalinity (pH).

E. Testing of existing concrete floor slabs for moisture and alkalinity (pH) has already been conducted; test report is attached.

F. Remediation of concrete floor slabs due to unsatisfactory moisture or alkalinity (pH) conditions.
   1. Contractor shall perform all specified remediation of concrete floor slabs. If such remediation is indicated by testing agency's report and is due to a condition not under Contractor's control or could not have been predicted by examination prior to entering into the contract, a contract modification will be issued.

G. Patching compound.

H. Remedial floor coatings.

I. Preparation of new and existing wood-based floors and subfloors for installation of new floor coverings.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Moisture emission reducing curing and sealing compound for slabs to receive adhered flooring, to prevent moisture content-related flooring failures; to remain in place, not to be removed.

1.03 REFERENCE STANDARDS

A. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens) 2020a.

B. ASTM C472 - Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters and Gypsum Concrete 1999 (Reapproved 2014).

C. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride 2016a.

D. RFCI (RWP) - Recommended Work Practices for Removal of Resilient Floor Coverings 2011.

1.04 SUBMITTALS

A. Visual Observation Report: For existing floor coverings to be removed.

B. Floor Covering and Adhesive Manufacturers' Product Literature: For each specific combination of substrate, floor covering, and adhesive to be used; showing:
   1. Moisture and alkalinity (pH) limits and test methods.
   2. Manufacturer's required bond/compatibility test procedure.

C. Testing Agency's Report:
   1. Description of areas tested; include floor plans and photographs if helpful.
   2. Summary of conditions encountered.
   3. Moisture and alkalinity (pH) test reports.
   4. Copies of specified test methods.
   5. Recommendations for remediation of unsatisfactory surfaces.
   6. Product data for recommended remedial coating.

7. Submit report to Architect.
8. Submit report not more than two business days after conclusion of testing.

D. Adhesive Bond and Compatibility Test Report.

E. Copy of RFCI (RWP).

1.05 QUALITY ASSURANCE

A. Moisture and alkalinity (pH) testing shall be performed by an independent testing agency employed and paid by Contractor.

B. Testing Agency Qualifications: Independent testing agency experienced in the types of testing specified.
1. Submit evidence of experience consisting of at least 3 test reports of the type required, with project Owner's project contact information.

C. Contractor's Responsibility Relating to Independent Agency Testing:
1. Provide access for and cooperate with testing agency.
2. Confirm date of start of testing at least 10 days prior to actual start.
3. Allow at least 4 business days on site for testing agency activities.
4. Achieve and maintain specified ambient conditions.
5. Notify Architect when specified ambient conditions have been achieved and when testing will start.

1.06 FIELD CONDITIONS

A. Maintain ambient temperature in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 65 degrees F or more than 85 degrees F.

B. Maintain relative humidity in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 40 percent and not more than 60 percent.

PART 2 PRODUCTS

2.01 MATERIALS

A. Patching Compound: Floor covering manufacturer's recommended product, suitable for conditions, and compatible with adhesive and floor covering. In the absence of any recommendation from flooring manufacturer, provide a product with the following characteristics:
1. Cementitious moisture-, mildew-, and alkali-resistant compound, compatible with floor, floor covering, and floor covering adhesive, and capable of being feathered to nothing at edges.
2. Compressive Strength: 3000 psi, minimum, after 28 days, when tested in accordance with ASTM C109/C109M or ASTM C472, whichever is appropriate.

B. Alternate Flooring Adhesive: Floor covering manufacturer's recommended product, suitable for the moisture and pH conditions present; low-VOC. In the absence of any recommendation from flooring manufacturer, provide a product recommended by adhesive manufacturer as suitable for substrate and floor covering and for conditions present.

C. Remedial Floor Coating: Single- or multi-layer coating or coating/overlay combination intended by its manufacturer to resist water vapor transmission to degree sufficient to meet flooring manufacturer's emission limits, resistant to the level of alkalinity (pH) found, and suitable for adhesion of flooring without further treatment.
1. Use product recommended by testing agency.

PART 3 EXECUTION

3.01 CONCRETE SLAB PREPARATION

A. Perform following operations in the order indicated:
1. Preliminary cleaning.
2. Moisture vapor emission tests; 3 tests in the first 1000 square feet and one test in each additional 1000 square feet, unless otherwise indicated or required by flooring

manufacturer.

3. Internal relative humidity tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
4. Alkalinity (pH) tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
5. Specified remediation, if required.
6. Patching, smoothing, and leveling, as required.
7. Other preparation specified.
8. Adhesive bond and compatibility test.
9. Protection.

B. Remediations:

1. Active Water Leaks or Continuing Moisture Migration to Surface of Slab: Correct this condition before doing any other remediation; re-test after correction.
2. Excessive Moisture Emission or Relative Humidity: If an adhesive that is resistant to the level of moisture present is available and acceptable to flooring manufacturer, use that adhesive for installation of the flooring; if not, apply remedial floor coating or remedial sheet membrane over entire suspect floor area.
3. Excessive Alkalinity (pH): If remedial floor coating is necessary to address excessive moisture, no additional remediation is required; if not, if an adhesive that is resistant to the level present is available and acceptable to the flooring manufacturer, use that adhesive for installation of the flooring; otherwise, apply a skim coat of specified patching compound over entire suspect floor area.

3.02 REMOVAL OF EXISTING FLOOR COVERINGS

A. Comply with local, State, and federal regulations and recommendations of RFCI Recommended Work Practices for Removal of Resilient Floor Coverings, as applicable to floor covering being removed.

B. Dispose of removed materials in accordance with local, State, and federal regulations and as specified.

3.03 MOISTURE VAPOR EMISSION TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.

C. Test in accordance with ASTM F1869 and as follows.

D. Plastic sheet test and mat bond test may not be substituted for the specified ASTM test method, as those methods do not quantify the moisture content sufficiently.

E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if test values exceed 3 pounds per 1000 square feet per 24 hours.

F. Report: Report the information required by the test method.

3.04 ALKALINITY TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if alkalinity (pH) test value is over 10.

3.05 ADHESIVE BOND AND COMPATIBILITY TESTING

A. Comply with requirements and recommendations of floor covering manufacturer.

3.06 APPLICATION OF REMEDIAL FLOOR COATING

A. Comply with requirements and recommendations of coating manufacturer.

END OF SECTION 09 05 61

SECTION 09 21 16
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Performance criteria for gypsum board assemblies.
B. Metal stud wall framing.
C. Metal channel ceiling framing.
D. Gypsum sheathing.
E. Cementitious backing board.
F. Gypsum wallboard.
G. Suspended gypsum board ceilings.
H. Joint treatment and accessories.
I. Plenum space sound control.
J. Textured finish system.
K. Repair of existing gypsum board.
L. Acoustic (sound-dampening) wall and ceiling board.

1.02 RELATED REQUIREMENTS

A. 2019 California Green Building Standatrds Code - Non-Residential Mandatory Measures.
B. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.
C. Section 05 40 00 - Cold-Formed Metal Framing: Structural steel stud framing.
D. Section 07 21 00 - Thermal Insulation: Acoustic insulation.
E. Section 07 25 00 - Weather Barriers: Water-resistive barrier over sheathing.

1.03 REFERENCE STANDARDS

A. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units 2018.
B. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units 1999 (Reaffirmed 2016).
C. ASHRAE Std 62.1 - Ventilation for Acceptable Indoor Air Quality Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.
E. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board 2017.
F. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members 2018.
G. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing 2017.
H. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products 2020.
I. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board 2020.
J. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness 2018.

K. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs 2020.

L. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base 2019.

M. ASTM C1178/C1178M - Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel 2018.

N. ASTM C1278/C1278M - Standard Specification for Fiber-Reinforced Gypsum Panel 2017.

O. ASTM C1325 - Standard Specification for Fiber-Mat Reinforced Cementitious Backer Units 2021.

P. ASTM C1396/C1396M - Standard Specification for Gypsum Board 2017.

Q. ASTM C1658/C1658M - Standard Specification for Glass Mat Gypsum Panels 2019, with Editorial Revision (2020).

R. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber 2016.

S. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements 2009 (Reapproved 2016).

T. ASTM E413 - Classification for Rating Sound Insulation 2016.

U. GA-216 - Application and Finishing of Gypsum Panel Products 2018.

V. GA-600 - Fire Resistance and Sound Control Design Manual, 22nd edition 2018.

W. UL (FRD) - Fire Resistance Directory Current Edition.

X. UL 752 - Standard for Bullet-Resisting Equipment Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on metal framing, gypsum board, accessories, and joint finishing system.

C. Samples: Submit two samples of predecorated gypsum board, 12 by 12 inches in size, illustrating finish color and texture.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing gypsum board installation and finishing, with minimum 5 years of experience.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

A. Provide completed assemblies complying with ASTM C840 and GA-216.

B. Interior Partitions, Indicated as Acoustic: Provide completed assemblies with the following characteristics:
   1. Acoustic Attenuation: STC of 50-54 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

C. Fire-Resistance-Rated Assemblies: Provide completed assemblies with the following characteristics:
   1. Fire-Resistance-Rated Partitions: GA-600 File Number WP 1052; 1 hour rating.
   2. Head of Fire-Resistance-Rated Partitions: per code; 1 hour rating.
   3. Fire-Resistance-Rated Ceilings and Soffits: One (1) hour fire rating.
   4. Gypsum Association File Numbers: Comply with requirements of GA-600 for the particular assembly.

2.02 METAL FRAMING MATERIALS

A. Manufacturers - Metal Framing, Connectors, and Accessories:
   1. ClarkDietrich: www.clarkdietrich.com/#sle.
   2. Jaimes Industries: www.jaimesind.com/#sle.
   3. Steel Construction Systems: www.steelconsystems.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Non-structural Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/120 at 5 psf.
   1. Studs: C-shaped with knurled or embossed faces.
   2. Runners: U shaped, sized to match studs.
   3. Ceiling Channels: C-shaped.
   4. Furring Members: Hat-shaped sections, minimum depth of 7/8 inch.
   5. Resilient Furring Channels: Single or double leg configuration; 1/2 inch channel depth.

C. Partition Head To Structure Connections: Provide track fastened to structure with legs of sufficient length to accommodate deflection, for friction fit of studs cut short and fastened as indicated on drawings.

D. Non-structural Framing Accessories:
   1. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.
   2. Partial Height Wall Framing Support: Provides stud reinforcement and anchored connection to floor.

2.03 BOARD MATERIALS

A. Manufacturers - Gypsum-Based Board:
   1. American Gypsum Company: www.americangypsum.com/#sle.
   2. CertainTeed Corporation: www.certainteed.com/#sle.
   3. Continental Building Products: www.continental-bp.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
   1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
   2. Glass mat faced gypsum panels, as defined in ASTM C1658/C1658M, suitable for paint finish, of the same core type and thickness may be substituted for paper-faced board.
   3. Unfaced fiber-reinforced gypsum panels as defined in ASTM C1278/C1278M, suitable for paint finish, of the same core type and thickness may be substituted for paper-faced board.
   4. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
   5. Thickness:
      a. Vertical Surfaces: 5/8 inch.
      b. Ceilings: 1/2 inch.
   6. Mold Resistant Paper Faced Products:
      a. American Gypsum Company; M-Bloc: www.americangypsum.com/#sle.
      b. American Gypsum Company; M-Bloc Type X: www.americangypsum.com/#sle.
      c. CertainTeed Corporation; M2Tech 1/2" Moisture & Mold Resistant Drywall: www.certainteed.com/#sle.
      d. Substitutions: See Section 01 60 00 - Product Requirements.

C. Backing Board For Wet Areas: One of the following products:
   1. Application: Horizontal surfaces behind tile in wet areas including countertops.
   2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
   3. ANSI Cement-Based Board: Non-gypsum-based; aggregated Portland cement panels with glass fiber mesh embedded in front and back surfaces complying with ANSI A118.9 or ASTM C1325.

a. Thickness: 1/2 inch.
b. Products:
1) Custom Building Products: www.custombuildingproducts.com/#sle.
2) National Gypsum Company; PermaBase Cement Board: www.nationalgypsum.com/#sle.
3) Substitutions: See Section 01 60 00 - Product Requirements.

D. Backing Board For Non-Wet Areas: Water-resistant gypsum backing board as defined in ASTM C1396/C1396M; sizes to minimum joints in place; ends square cut.
1. Application: Vertical surfaces behind thinset tile, except in wet areas.
2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
3. Edges: Tapered.
4. Products:
a. American Gypsum Company; M-Bloc: www.americangypsum.com/#sle.
b. Substitutions: See Section 01 60 00 - Product Requirements.

E. Ceiling Board: Special sag resistant gypsum ceiling board as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
1. Application: Ceilings, unless otherwise indicated.
2. Thickness: 5/8 inch.
3. Edges: Tapered.
4. Products:
a. Basis of Design: USG Corporation; 5/8 Inch Sheetrock Brand UltraLight Panels: www.usg.com/#sle.
b. Substitutions: See Section 01 60 00 - Product Requirements.

F. Acoustical Sound Dampening Wall and Ceiling Board: Two layers of heavy paper-faced, high-density gypsum board separated by a viscoelastic polymer layer and capable of achieving STC rating of 50 or more in typical stud wall assemblies as calculated in accordance with ASTM E413 and when tested in accordance with ASTM E90.
1. Thickness: 5/8 inch.
2. Long Edges: Tapered.
3. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.

2.04 PLENUM SPACE SOUND CONTROL

A. Manufacturers:
1. AcoustiGuard – WILREP LTD; Privacy Board and Return-Air Silencers: www.acoustiguard.com/#sle.
2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: Acoustical extension wall board for noise control within ceiling plenums above wall partitions.

C. General Requirements:
1. Airstream surfaces installed in return air plenum to comply with requirements in ASHRAE Std 62.1.

D. Configuration: As indicated on drawings.

2.05 GYPSUM WALLBOARD ACCESSORIES

A. Acoustic Insulation: As specified in Section 07 21 00.

B. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.

C. Beads, Joint Accessories, and Other Trim: ASTM C1047, rigid plastic, galvanized steel, or rolled zinc, unless noted otherwise.

D. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.

E. High Build Drywall Surfacer: Vinyl acrylic latex-based coating for spray application, designed to take the place of skim coating and separate paint primer in achieving Level 5 finish.

F. Textured Finish Materials: Latex-based compound; plain.
   1. Products:
      a. CertainTeed Corporation; Extreme Texture Coat/Acrylic Texture with M2Tech: www.certainteed.com/#sle.
      b. Sherwin-Williams; Tuff Surface Premium Texture Finish: www.sherwin-williams.com/#sle.
      c. Substitutions: See Section 01 60 00 - Product Requirements.

G. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.

H. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch in Thickness: ASTM C954; steel drill screws, corrosion-resistant.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.02 FRAMING INSTALLATION

A. Metal Framing: Install in accordance with ASTM C754 and manufacturer's instructions.

B. Suspended Ceilings and Soffits: Space framing and furring members as indicated.

C. Studs: Space studs at 16 inches on center.
   1. Extend partition framing to structure where indicated and to ceiling in other locations.
   2. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.
   3. Partitions Terminating at Structure: Attach top runner to structure, maintain clearance between top of studs and structure, and connect studs to track using specified mechanical devices in accordance with manufacturer's instructions; verify free movement of top of stud connections; do not leave studs unattached to track.

3.03 ACOUSTIC ACCESSORIES INSTALLATION

A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

B. Acoustic Sealant: Install in accordance with manufacturer's instructions.

3.04 BOARD INSTALLATION

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Single-Layer Nonrated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.

C. Single-Layer Nonrated on Concrete: Install gypsum board over 1x fire treated wood furring trips of 7/8" metal hat channelts.

D. Fire-Resistance-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.

E. Cementitious Backing Board: Install over steel framing members and plywood substrate where indicated, in accordance with ANSI A108.11 and manufacturer's instructions.

3.05 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.

B. Corner Beads: Install at external corners, using longest practical lengths.

C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

3.06 JOINT TREATMENT

A. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
   1. Level 5: Walls and ceilings to receive semi-gloss or gloss paint finish and at the following areas:
      a. First Floor, Building 2 - Public Lobby 2-101 to receive wallcovering .
   2. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated. Includes new and existing walls.
   3. Level 3: Walls to receive textured wall finish.Only where indicated on plans.
   4. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
   5. Level 1: Fire-resistance-rated wall areas above finished ceilings, whether or not accessible in the completed construction.

B. All existing gypsum board finishes in occupied areas that are Level 3 finish or lower to be refinished to Level 4. Typical throughout both buildings.

C. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
   1. Feather coats of joint compound so that camber is maximum 1/32 inch.

D. Where Level 5 finish is indicated, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.

3.07 TEXTURE FINISH

A. Apply finish texture coating by means of spraying apparatus in accordance with manufacturer's instructions and to match approved sample.

3.08 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

END OF SECTION 09 21 16

SECTION 09 22 16
NON-STRUCTURAL METAL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal partition, ceiling, and soffit framing.

B. Framing accessories.

1.02 RELATED REQUIREMENTS

A. Section 05 50 00 - Metal Fabrications: Metal fabrications attached to stud framing.

B. Section 05 50 00 - Metal Fabrications: Execution requirements for anchors for attaching work of this section.

C. Section 07 21 00 - Thermal Insulation: Acoustic insulation.

D. Section 07 84 00 - Firestopping: Sealing top-of-wall assemblies at fire-resistance-rated walls.

E. Section 07 92 00 - Joint Sealants: Sealing acoustical gaps in construction other than gypsum board or plaster work.

F. Section 09 21 16 - Gypsum Board Assemblies: Metal studs for gypsum board partition framing.

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2019.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.

C. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members 2015.

D. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members 2018.

E. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products 2020.

F. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs 2020.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data describing framing member materials and finish, product criteria, load charts, and limitations.

1.05 QUALITY ASSURANCE

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Framing, Connectors, and Accessories:
   1. USG: www.usg.com.
   2. CEMCO: www.cemcosteel.com/#sle.
   3. ClarkDietrich: www.clarkdietrich.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 FRAMING MATERIALS

A. Non-Loadbearing Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf.
   1. Studs: C shaped with knurled or embossed faces.
   2. Runners: U shaped, sized to match studs.
   3. Ceiling Channels: C shaped.

4. Furring: Hat-shaped sections, minimum depth of 7/8 inch.
5. Resilient Furring Channels: Single or double leg configuration; 1/2 inch channel depth.
6. Resilient Sound Isolation Clips: Steel resilient clips with molded rubber isolators, attaches to framing; improves noise isolation for areas between gypsum board assemblies and adjacent sources of noise.

B. Partition Head to Structure Connections: Provide track fastened to structure with legs of sufficient length to accommodate deflection, for friction fit of studs cut short and braced with continuous bridging on both sides.

C. Preformed Top Track Firestop Seal:
1. Provide components UL-listed for use in UL-listed fire-resistance-rated head of partition joint systems indicated on drawings.
2. Products:
a. Hilti, Inc; Top Track Seal CFS TTS: www.us.hilti.com/#sle.
b. Specified Technologies Inc; SpeedFlex TTG Track Top Gasket: www.stfirestop.com/#sle.
c. Substitutions: See Section 01 60 00 - Product Requirements.

D. Non-Loadbearing Framing Accessories:
1. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.
2. Partial Height Wall Framing Support: Provides stud reinforcement and anchored connection to floor.
a. Materials: ASTM A36/A36M formed sheet steel support member with factory-welded ASTM A1003/A1003M steel plate base.
3. Framing Connectors: ASTM A653/A653M G90 galvanized steel clips; secures cold rolled channel to wall studs for lateral bracing.
4. Sheet Metal Backing: 0.036 inch thick, galvanized.
5. Fasteners: ASTM C1002 self-piercing tapping screws.
6. Anchorage Devices: Powder actuated.
7. Acoustic Insulation: As specified in Section 07 21 00.
8. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.

E. Shaft Wall Sysem:
1. Stud shape: CH.
2. Gauge: 25.
3. Depth: 2.5".
4. Design Thickness: 0.0188".
5. Fire Rating: 2-hour, UL Design U415..
6. Stud spacing: 24" o.c.
7. Products:
a. USG; Shaft wall system.
b. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 FABRICATION

A. Fabricate assemblies of framed sections to sizes and profiles required.

B. Fit, reinforce, and brace framing members to suit design requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

3.02 INSTALLATION OF STUD FRAMING

A. Extend partition framing to structure where indicated and to ceiling in other locations.

B. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.

C. Align and secure top and bottom runners at 24 inches on center.

D. Fit runners under and above openings; secure intermediate studs to same spacing as wall studs.

E. Align stud web openings horizontally.

F. Secure studs to tracks using crimping method. Do not weld.

G. Fabricate corners using a minimum of three studs.

H. Install double studs at wall openings, door and window jambs, not more than 2 inches from each side of openings.

I. Coordinate installation of bucks, anchors, and blocking with electrical, mechanical, and other work to be placed within or behind stud framing.

J. Sound Isolation Clips: Mechanically attach to framing or structure with fasteners recommended by clip manufacturer. Install at spacing indicated on drawings.

K. Furring: Coordinate with sound isolation clip spacing and locations. Lap splices a minimum of 6 inches.

3.03 CEILING AND SOFFIT FRAMING

A. Install furring after work above ceiling or soffit is complete. Coordinate the location of hangers with other work.

B. Install furring independent of walls, columns, and above-ceiling work.

C. Securely anchor hangers to structural members or embed them in structural slab. Space hangers as required to limit deflection to criteria indicated. Use rigid hangers at exterior soffits.

D. Space main carrying channels at maximum 72 inch on center, and not more than 6 inches from wall surfaces. Lap splice securely.

E. Securely fix carrying channels to hangers to prevent turning or twisting and to transmit full load to hangers.

F. Place furring channels perpendicular to carrying channels, not more than 2 inches from perimeter walls, and rigidly secure. Lap splices securely.

3.04 TOLERANCES

A. Maximum Variation From True Position: 1/8 inch in 10 feet.

B. Maximum Variation From Plumb: 1/8 inch in 10 feet.

END OF SECTION 09 22 16

This page intentionally left blank

SECTION 09 30 00
TILING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Tile for floor applications.

B. Tile for wall applications.

C. Cementitious backer board as tile substrate.

D. Stone thresholds.

E. Ceramic accessories.

F. Ceramic trim.

1.02 RELATED REQUIREMENTS

A. Section 07 92 00 - Joint Sealants: Sealing joints between tile work and adjacent construction and fixtures.

B. Section 09 24 00 - Cement Plastering: Lath and Portland cement scratch coat, where required by the TCNA (HB) Method specified.

C. Section 22 40 00 - Plumbing Fixtures: water closets, urinals and sinks in tile walls or floors.

1.03 REFERENCE STANDARDS

A. ANSI A108/A118/A136 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium) 2019.

B. ANSI A108.1a - American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar 2017.

C. ANSI A108.1b - American National Standard Specifications for Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex-Portland Cement Mortar 2017.

D. ANSI A108.1c - Contractor's Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar or Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex-Portland Cement Mortar 1999 (Reaffirmed 2021).

E. ANSI A108.2 - American National Standard General Requirements: Materials, Environmental and Workmanship 2019.

F. ANSI A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesives or Water Cleanable Tile-Setting Epoxy Adhesive 2019.

G. ANSI A108.5 - American National Standard Specifications for Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar 2020.

H. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy 1999 (Reaffirmed 2019).

I. ANSI A108.8 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout 1999 (Reaffirmed 2019).

J. ANSI A108.9 - American National Standard Specifications for Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout 1999 (Reaffirmed 2019).

K. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework 2017.

L. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units 2018.

M. ANSI A108.12 - American National Standard for Installation of Ceramic Tile with EGP (Exterior Glue Plywood) Latex-Portland Cement Mortar 1999 (Reaffirmed 2019).

N. ANSI A108.13 - American National Standard for Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone 2005 (Reaffirmed 2021).

O. ANSI A108.19 - American National Standard Specifications for Interior Installation of Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs by the Thin-Bed Method Bonded with Modified Dry-Set Cement Mortar or Improved Modified Dry-Set Cement Mortar 2020.

P. ANSI A118.3 - American National Standard Specifications for Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy and Water Cleanable Tile-Setting Epoxy Adhesive 2013 (Revised).

Q. ANSI A118.4 - American National Standard Specifications for Modified Dry-Set Cement Mortar 2012 (Revised).

R. ANSI A118.7 - American National Standard Specifications for High Performance Cement Grouts for Tile Installation 2010 (Reaffirmed 2016).

S. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units 1999 (Reaffirmed 2016).

T. ANSI A118.10 - American National Standard Specifications for Load Bearing, Bonded, Waterproof Membranes For Thin-Set Ceramic Tile And Dimension Stone Installation 2014.

U. ANSI A118.12 - American National Standard Specifications for Crack Isolation Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation 2014.

V. ASTM C373 - Standard Test Methods for Determination of Water Absorption and Associated Properties by Vacuum Method for Pressed Ceramic Tiles and Glass Tiles and Boil Method for Extruded Ceramic Tiles and Non-tile Fired Ceramic Whiteware Products 2018.

W. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation 2019.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by affected installers.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.

C. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.

D. Samples: Mount tile and apply grout on two plywood panels, minimum 18 by 18 inches in size illustrating pattern, color variations, and grout joint size variations.

E. Installer's Qualification Statement:
   1. Submit documentation of National Tile Contractors Association (NTCA) or Tile Contractors' Association of America (TCAA) accreditation.

F. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.

G. Maintenance Materials: Furnish the following for City's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Tile: 2 percent of each size, color, and surface finish combination.

1.06 QUALITY ASSURANCE

A. Maintain one copy of and ANSI A108/A118/A136 and TCNA (HB) on site.

B. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum five years of documented experience.

C. Installer Qualifications:
   1. Company specializing in performing tile installation, with minimum of 8 years of documented experience.
      a. Accredited Five-Star member of the National Tile Contractors Association (NTCA) or Trowel of Excellence member of the Tile Contractors' Association of America (TCAA).

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.08 FIELD CONDITIONS

A. Do not install solvent-based products in an unventilated environment.

B. Maintain ambient and substrate temperature above 50 degrees F and below 100 degrees F during installation and curing of setting materials.

PART 2 PRODUCTS

2.01 TILE

A. Manufacturers:
   1. Dal-Tile Corporation: www.daltile.com/#sle.
   2. Emser Tile, LLC: www.emser.com/#sle.
   3. American Olean Corporation: www.americanolean.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Ceramic Wall Tile:
   1. Type: See Interior Finish Legend
   2. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
   3. Colors: See Interior Finish Legend
   4. Pattern: See Interior Finish Legend
   5. Trim Units: Matching bullnose, double bullnose, cove base, and cove shapes in sizes coordinated with field tile.

C. Ceramic Floor Tile:
   1. Type: See Interior Finish Legend
   2. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
   3. Colors: See Interior Finish Legend
   4. Pattern: See Interior Finish Legend
   5. Trim Units: Matching bullnose, double bullnose, cove base, and cove shapes in sizes coordinated with field tile.
   6.

2.02 TRIM AND ACCESSORIES

A. Ceramic Accessories: Glazed finish, same color and finish as adjacent field tile; same manufacturer as tile.

B. Ceramic Trim: Matching bullnose, double bullnose, cove base, and cove ceramic shapes in sizes coordinated with field tile.
   1. Applications:
      a. Open Edges: Bullnose.
      b. Inside Corners: Jointed.
      c. Floor to Wall Joints: Cove base.
   2. Manufacturers: Same as for tile.

C. Thresholds: 2 inches wide by full width of wall or frame opening; beveled edge on both long edges; without holes, cracks, or open seams.
   1. Thickness: 1/2 inch.
   2. Material: Solid surface acrylic resin, mineral filler, and pigments; non-porous, color and pattern consistent throughout thickness.
   3. Applications:

a. At doorways where tile terminates.
b. At open edges of floor tile where adjacent finish is a different height.

D. Edge Strips:
1. Model No.: See Interior Schedule
2. Material: Anodized Aluminium
3. Manufacturers:
a. Schluter-Systems: www.schluter.com/#sle.
b. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 SETTING MATERIALS

A. Provide setting and grout materials from same manufacturer.

B. Manufacturers:
1. ARDEX Engineered Cements: www.ardexamericas.com/#sle.
2. Custom Building Products: www.custombuildingproducts.com/#sle.
3. LATICRETE International, Inc: www.laticrete.com/#sle.
4. Substitutions: See Section 01 60 00 - Product Requirements.

C. Latex-Portland Cement Mortar Bond Coat: ANSI A118.4.
1. Applications: Use this type of bond coat where Large and Heavy Tile (LHT) mortar is indicated.
2. Products:
a. ARDEX Engineered Cements; ARDEX X 5: www.ardexamericas.com/#sle.
b. Custom Building Products; ProLite Premium Rapid Setting Large Format Tile Mortar, with Multi-Surface Bonding Primer: www.custombuildingproducts.com/#sle.
c. LATICRETE International, Inc; 257 TITANIUM: www.laticrete.com/#sle.
d. Substitutions: See Section 01 60 00 - Product Requirements.

D. Epoxy Adhesive and Mortar Bond Coat: ANSI A118.3.
1. Applications: Where indicated on drawings.
2. Products:
a. Custom Building Products; EBM-Lite Epoxy Bonding Mortar: www.custombuildingproducts.com/#sle.
b. LATICRETE International, Inc; LATICRETE LATAPOXY 300 Adhesive: www.laticrete.com/#sle.
c. Merkrete, by Parex USA, Inc; Merkrete Pro Epoxy: www.merkrete.com/#sle.
d. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 GROUTS

A. Provide setting and grout materials from same manufacturer.

B. Manufacturers:
1. Custom Building Products: www.custombuildingproducts.com/#sle.
2. LATICRETE International, Inc; LATICRETE PERMACOLOR Grout: www.laticrete.com/#sle.
3. Merkrete, by Parex USA, Inc; Merkrete Duracolor Non-Sanded Color Grout: www.merkrete.com/#sle.
4. Substitutions: See Section 01 60 00 - Product Requirements.

C. High Performance Polymer Modified Grout: ANSI A118.7 polymer modified cement grout.
1. Applications: Use this type of grout where indicated and where no other type of grout is indicated.
2. Use sanded grout for joints 1/8 inch wide and larger; use unsanded grout for joints less than 1/8 inch wide.
3. Color(s): As indicated on drawings.
4. Products:
a. ARDEX Engineered Cements; ARDEX FL: www.ardexamericas.com/#sle.

b. Custom Building Products; Prism Color Consistent Grout: www.custombuildingproducts.com/#sle.
c. LATICRETE International, Inc; LATICRETE PERMACOLOR Grout: www.laticrete.com/#sle.
d. Merkrete, by Parex USA, Inc; Merkrete Pro Grout: www.merkrete.com/#sle.

D. Epoxy Grout: ANSI A118.3 chemical resistant and water-cleanable epoxy grout.
1. Applications: Where indicated.

2.05 MAINTENANCE MATERIALS

A. Tile Sealant: Gunnable, silicone, siliconized acrylic, or urethane sealant; moisture and mildew resistant type.
1. Applications: Between tile and plumbing fixtures.
2. Color(s): As selected by Architect from manufacturer's full line.
3. Products:
a. Custom Building Products; Commercial 100% Silicone Caulk: www.custombuildingproducts.com/#sle.
b. LATICRETE International, Inc; LATICRETE LATASIL: www.laticrete.com/#sle.
c. Merkrete, by Parex USA, Inc; Merkrete Colored Caulking: www.merkrete.com/#sle.
d. Substitutions: See Section 01 60 00 - Product Requirements.

B. Grout Sealer: Liquid-applied, moisture and stain protection for existing or new Portland cement grout.
1. Composition: Water-based colorless silicone.
2. Products:
a. Merkrete, by Parex USA, Inc; Merkrete Grout Sealer: www.merkrete.com/#sle.

C. Tile Sealer: Stain protection for ceramic tile and natural stone tile.
1. Products:
a. Custom Building Products; Aqua Mix Enrich 'N' Seal: www.custombuildingproducts.com/#sle.

2.06 ACCESSORY MATERIALS

A. Waterproofing Membrane at Floors: Specifically designed for bonding to cementitious substrate under thick mortar bed or thin-set tile; complying with ANSI A118.10.
1. Crack Resistance: No failure at 1/16 inch gap, minimum; comply with ANSI A118.12.
2. Fluid or Trowel Applied Type:
a. Material: Synthetic rubber or Acrylic.
b. Thickness: 25 mils, minimum, dry film thickness.
c. Products:
1) ARDEX Engineered Cements; ARDEX 8+9: www.ardexamericas.com/#sle.
2) Custom Building Products; RedGard Crack Prevention and Waterproofing Membrane: www.custombuildingproducts.com/#sle.
3) LATICRETE International, Inc; LATICRETE HYDRO BAN: www.laticrete.com/#sle.
4) Merkrete, by Parex USA, Inc; Merkrete Hydro Guard 2000: www.merkrete.com/#sle.
5) Substitutions: See Section 01 60 00 - Product Requirements.

B. Underlayment at Floors: Specifically designed for bonding to thin-set setting mortar; not primarily a waterproofing material and having the following characteristics:
1. Crack Resistance: No failure at 1/16 inch gap, minimum; comply with ANSI A118.12.
2. Uncoupling Function: Allow for separation between membrane and the mortar adhering tile to the membrane when subjected to excessive substrate movement.
3. Type: Thin-Set Mortar Adhered Sheet.
a. Products:
1) Schluter Syhstems: Ditra Uncouplin Membrane: www.schulter.com

2) Custom Building Products; EasyMat Tile & Stone Underlayment: www.custombuildingproducts.com/#sle.
3) LATICRETE International, Inc; LATICRETE STRATA MAT: www.laticrete.com/#sle.
4) Substitutions: See Section 01 60 00 - Product Requirements.

C. Backer Board: Cementitious type complying with ANSI A118.9; high density, glass fiber reinforced, 1/2 inch thick; 2 inch wide coated glass fiber tape for joints and corners.
1. Products:
a. Custom Building Products; WonderBoard Lite Backerboard: www.custombuildingproducts.com/#sle.
b. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that subfloor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.

C. Cementitious Subfloor Surfaces: Verify that substrates are ready for tiling installation by testing for moisture and alkalinity (pH).
1. Obtain instructions if test results are not within limits recommended by tiling material manufacturer and setting material manufacturer.

3.02 PREPARATION

A. Protect surrounding work from damage.

B. Vacuum clean surfaces and damp clean.

C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

D. Install backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of setting material to a feather edge.

3.03 INSTALLATION - GENERAL

A. Install tile, thresholds, and stair treads and grout in accordance with applicable requirements of ANSI A108.1a through ANSI A108.19 , manufacturer's instructions, and TCNA (HB) recommendations.

B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.

C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.

D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.

E. Form internal angles square and external angles bullnosed.

F. Install ceramic accessories rigidly in prepared openings.

G. Install thresholds where indicated.

H. Sound tile after setting. Replace hollow sounding units.

I. Keep control and expansion joints free of mortar, grout, and adhesive.

J. Prior to grouting, allow installation to completely cure; minimum of 48 hours.

K. Grout tile joints unless otherwise indicated. Use standard grout unless otherwise indicated.

L. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

3.04 INSTALLATION - FLOORS - THIN-SET METHODS

A. Over interior concrete substrates, install in accordance with TCNA (HB) Method F113, dry-set or latex-Portland cement bond coat, with standard grout, unless otherwise indicated.
   1. Use uncoupling membrane under all tile unless other underlayment is indicated.
   2. Where waterproofing membrane is indicated, install in accordance with TCNA (HB) Method F122, with latex-Portland cement grout.

3.05 INSTALLATION - WALL TILE

A. On exterior walls install in accordance with TCNA (HB) Method W244, thin-set over cementitious backer units, with waterproofing membrane.

B. Over cementitious backer units install in accordance with TCNA (HB) Method W223, organic adhesive.

C. Over gypsum wallboard on wood or metal studs install in accordance with TCNA (HB) Method W243, thin-set with dry-set or latex-Portland cement bond coat, unless otherwise indicated.

D. Over interior concrete and masonry install in accordance with TCNA (HB) Method W202, thin-set with dry-set or latex-Portland cement bond coat.

3.06 CLEANING

A. Clean tile and grout surfaces.

3.07 PROTECTION

A. Do not permit traffic over finished floor surface for 4 days after installation.

END OF SECTION 09 30 00

This page intentionally left blank

SECTION 09 51 00
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Acoustical units.

C. Supplementary acoustical insulation above ceiling.

1.02 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 03 30 00 - Cast-in-Place Concrete: Placement of special anchors or inserts for suspension system.

C. Section 21 13 00 - Fire-Suppression Sprinkler Systems: Sprinkler heads in ceiling system.

D. Section 23 37 00 - Air Outlets and Inlets: Air diffusion devices in ceiling.

E. Section 26 51 00 - Interior Lighting: Light fixtures in ceiling system.

F. Section 28 46 00 - Fire Detection and Alarm: Fire alarm components in ceiling system.

1.03 REFERENCE STANDARDS

A.

B. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures Most Recent Edition Cited by Referring Code or Reference Standard.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.

D. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar 2015.

E. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate 2014.

F. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric) 2014.

G. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings 2017.

H. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels 2013.

I. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions 2020.

J. ASTM E1264 - Standard Classification for Acoustical Ceiling Products 2019.

K. CHPS (HPPD) - High Performance Products Database Current Edition at www.chps.net/.

L. UL (GGG) - GREENGUARD Gold Certified Products Current Edition.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on suspension system components and acoustical units.

C. Samples: Submit two samples 12x12 inch in size illustrating material and finish of acoustical units.

D. Maintenance Materials: Furnish the following for City's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Acoustical Units: Quantity equal to 5 percent of total installed.

1.05 QUALITY ASSURANCE

A. Designer Qualifications for Seismic Design: Perform under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed at the State in which the Project is located.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acoustic Tiles/Panels:
   1. Armstrong World Industries, Inc: www.armstrongceilings.com/#sle.
   2. CertainTeed Corporation: www.certainteed.com/#sle.
   3. USG Corporation: www.usg.com/ceilings/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Suspension Systems:
   1. Same as for acoustical units.

2.02 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Ceiling systems designed to withstand the effects of earthquake motions determined according to ASCE 7 for Seismic Design Category D, E, or F and complying with the following:
   1. Local authorities having jurisdiction.

2.03 ACOUSTICAL UNITS

A. Acoustical Units - General: ASTM E1264, Class A.
   1. VOC Content: As specified in Section 01 61 16.
   2. VOC Content: Certified as Low Emission by one of the following:
      a. Product listing in UL (GGG).
      b. Product listing in CHPS (HPPD).

B. Acoustical Panels: Painted mineral fiber, with the following characteristics:
   1. Classification: ASTM E1264 Type III.
      a. Form: 1, nodular.
   2. Size: 24 by 48 inch and 24 by 48 inch, as indicated in reflected ceiling plans.
   3. Thickness: 3/4 inch.
   4. Ceiling Attenuation Class (CAC): 35, determined in accordance with ASTM E1264.
   5. Panel Edge: Tegular.
   6. Color: White.
   7. Suspension System: 9/16" t-bar.
   8. Products:
      a. Basis of Design: USG Corporation; Radar Acoustical Panels: www.usg.com/ceilings/#sle.

2.04 SUSPENSION SYSTEM(S)

A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.
   1. Materials:
      a. Steel Grid: ASTM A653/A653M, G30 coating, unless otherwise indicated.
      b. Aluminum Grid: Aluminum sheet, ASTM B209 (ASTM B209M).
      c. Stainless Steel Grid: ASTM A666, Type 304.

B. Exposed Suspension System: Hot-dipped galvanized steel grid.
   1. Application(s): Seismic.
   2. Structural Classification: Intermediate-duty, when tested in accordance with ASTM C635/C635M.
   3. Profile: Slotted Reveal Tee; 9/16 inch face width, with 1/8 inch center reveal.

4. Finish: Baked enamel.
5. Color: White.
6. Basisi of Design Product:
   a. USG Corporation; Donn Brand Fineline 1/8 DXFF Acoustical Suspension System: www.usg.com/ceilings/#sle.
   b. Substitutions: See Section 01 60 00 - Product Requirements.

2.05 ACCESSORIES

A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.

B. Hanger Wire: 12 gauge, 0.08 inch galvanized steel wire.

C. Hold-Down Clips: Manufacturer's standard clips to suit application.

D. Seismic Clips: Manufacturer's standard clips for seismic conditions and to suit application.

E. Perimeter Moldings: Same metal and finish as grid.
   1. Size: As required for installation conditions and specified Seismic Design Category.
   2. Angle Molding: L-shaped, for mounting at same elevation as face of grid.

F. Acoustical Insulation: Specified in Section 07 21 00.
   1. Thickness: 6 inch.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

3.02 PREPARATION

A. Install after major above-ceiling work is complete.

B. Coordinate the location of hangers with other work.

3.03 INSTALLATION - SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions and as supplemented in this section.

B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

C. Locate system on room axis according to reflected plan.

D. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
   1. Use longest practical lengths.
   2. Overlap and rivet corners.

E. Suspension System, Non-Seismic: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

F. Seismic Suspension System, Seismic Design Category D: Hang suspension system with grid ends attached to the perimeter molding on two adjacent walls; on opposite walls, maintain a 3/4 inch clearance between grid ends and wall.

G. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

H. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

I. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.

J. Do not eccentrically load system or induce rotation of runners.

3.04 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Fit border trim neatly against abutting surfaces.

D. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

E. Cutting Acoustical Units:
   1. Cut to fit irregular grid and perimeter edge trim.
   2. Make field cut edges of same profile as factory edges.

F. Where round obstructions occur, provide preformed closures to match perimeter molding.

G. Lay acoustical insulation for a distance of 48 inches either side of acoustical partitions as indicated.

3.05 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION 09 51 00

SECTION 09 54 26
SUSPENDED WOOD CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wood grilles.

B. Metal suspension system.

1.02 RELATED REQUIREMENTS

A. Division 23 - Coordinate installation of linear slot diffusers to align with wood grille slat openings; see Mechanical drawings.

B. Division 26 - Coordinate installation of suspended lighting fixtures with wood grille suspension system; see Electrical drawings.

1.03 REFERENCE STANDARDS

A. 2019 California Green Building Standatrds Code - Non-Residential Mandatory Measures.

B. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings 2017.

C. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels 2013.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2021a.

E. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions 2020.

F. CISCA (WC) - Wood Ceilings Technical Guidelines 2009.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Sequence work to ensure ceilings are not installed until building is enclosed, dust generating activities have terminated, and overhead work is completed.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate grid layout and related dimensioning, attachment of wood ceiling components to grid, accessory attachments, junctions with other ceiling finishes, and mechanical and electrical items installed in the ceiling.

C. Product Data: Provide data on wood ceiling components and suspension system components.

D. Samples: Submit two full size samples illustrating material and finish of wood ceiling components.

E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

F. Maintenance Materials: Furnish the following for City's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Wood Ceiling Components: Provide a quantity equal to 2 percent of total product installed.

1.06 QUALITY ASSURANCE

A. Designer Qualifications for Seismic Design: Under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed at the State in which the Project is located.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Installer Qualifications: Company specializing in performing the work of this section.
   1. Approved by wood ceiling manufacturer.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver wood ceiling components to project site in original, unopened packages.

B. Store in fully enclosed space, flat, level and off the floor.

1.08 FIELD CONDITIONS

A. Do not install suspended wood ceiling system until wet construction work is complete and permanent heat and air conditioning is installed and operating.

B. Maintain room temperature between 60 degrees F and 75 degrees F and relative humidity between 35 to 55 percent before, during, and after installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Suspended Wood Ceilings:
   1. Basis of Design: Armstrong World Industries, Inc; Woodworks: www.armstrongceilings.com/#sle.
   2. Rulon International: www.rulonco.com/#sle.
   3. USG Corporation: www.usg.com/ceilings/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 SUSPENDED WOOD CEILING SYSTEM

A. Performance Requirements:
   1. Design for maximum deflection of 1/360 of span.
   2. Design to resist seismic load by using practices specified in ASTM E580.

B. Wood-Based Materials:
   1. Certified as sustainably harvested as specified in Section 01 60 00.
   2. Solid Wood: Clear, dry, sound, plain sawn, selected for compatible species, grain and color, no defects.
   3. Composite Wood Panels: Containing no urea-formaldehyde resin binders.

C. Wood Grilles: Pre-assembled module of solid wood grilles with battens and dowels.
   1. Grille Size: 12 inch width by 96 inch depth.
   2. Grille Spacing (Reveal): 2 3/4 inch.
   3. Solid Wood Species: Light Cherry.
      a. Factory Finish: Clear sealer.
   4. Attachment to Suspension Grid: Direct screw attachment to suspension grid.
   5. Suspension System: Type specified below.

D. Metal Suspension System:
   1. General: Comply with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.
   2. Exposed Suspension System: Hot-dipped galvanized steel grid and cap.
      a. Structural Classification: Heavy-duty, when tested in accordance with ASTM C635/C635M.
      b. Profile: Tee; 15/16 inch face width.
      c. Finish/Color: Baked enamel, black.
      d. Basis of Design Product: Armstrong Prelude XL Heavy Duty Suspension System
         1) Substitutions: See Section 01 60 00 - Product Requirements.
   3. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement.

E. Accessories: Manufacturer's standard accessories for installation method indicated, seismic requirements and above-ceiling accessibility.

2.03 FABRICATION

A. Shop fabricate wood ceiling components to the greatest extent possible.

B. Fabricate components to allow access to ceiling plenum as required.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Do not install ceiling until after interior wet work is dry.

3.02 PREPARATION

A. Coordinate the location of hangers with other work.

B. Layout wood ceiling components in pattern according to reflected ceiling plan and as shown on shop drawings.

C. Acclimate wood ceiling materials by removing from packaging in installation area a minimum of 48 hours prior to installation.

3.03 INSTALLATION

A. General: Install suspended wood ceiling system in accordance with CISCA (WC).

B. Suspension System:
   1. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions and as supplemented in this section.
   2. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.
   3. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
   4. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.
   5. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.
   6. Do not eccentrically load system or induce rotation of runners.
   7. Form expansion joints as detailed. Form to accommodate plus or minus 1 inch movement. Maintain visual closure.

C. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.

D. Wood Ceiling:
   1. Install wood ceilings in accordance with manufacturer's instructions.
   2. Fit wood components in place, free from damaged edges or other defects detrimental to appearance and function.
   3. Install components in uniform plane, and free from twist, warp, and dents.
   4. Cut to fit irregular grid and perimeter edge trim.
   5. Make field cut edges of same profile as factory edges, seal and finish according to manufacturer.
   6. Install clips, stabilizer bars, and other attachments as indicated to secure wood ceiling components tight to the grid system.

3.04 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

3.05 CLEANING

A. Clean and touch up minor finish damage. Remove and replace components that cannot be successfully cleaned and repaired.

END OF SECTION 09 54 26

SECTION 09 65 00
RESILIENT FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Static dissipative resilient tile flooring.

B. Resilient tile flooring.

C. Resilient base.

D. Installation accessories.

1.02 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 03 30 00 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied resilient flooring.

1.03 REFERENCE STANDARDS

A. 2019 California Green Building Standatrds Code - Non-Residential Mandatory Measures.

B. ASTM F1066 - Standard Specification for Vinyl Composition Floor Tile 2004 (Reapproved 2018).

C. ASTM F1700 - Standard Specification for Solid Vinyl Floor Tile 2020.

D. ASTM F1861 - Standard Specification for Resilient Wall Base 2021.

E. RFCI (RWP) - Recommended Work Practices for Removal of Resilient Floor Coverings 2011.

1.04 SUBMITTALS

A. Provide MSDS or other manufacturer documentation with disclosure of VOC content for all wet-applied products.

B. Product data shall be provided indicating the levels of post- and pre-consumer recycled content.

C. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

D. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

E. Provide documentation showing compliance with CalGreen Section 5.504.4.6.

F. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.

G. Provide manufacturers' third party certification that includes a printed statement of certification with either Green Label Plus, Green Label, or FloorScore OR compliance with the California Department of Health standard.

H. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

I. RFCI FloorScore Certification

J. Maintenance Materials: Furnish the following for City's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Flooring Material: 400 square feet of each type and color.
   3. Extra Wall Base: 50 linear feet of each type and color.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified flooring with minimum three years documented experience.

B. Installer Qualifications: Company specializing in installing specified flooring with minimum three years documented experience.

C. Pre-installation Meeting: Conduct an on-site pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions and manufacturer's warranty requirements.

D. Testing Agency Qualifications: Independent firm specializing in performing concrete slab moisture testing and inspections of the type specified in this section.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.

B. Store all materials off of the floor in an acclimatized, weather-tight space.

C. Maintain temperature in storage area between 55 degrees F and 90 degrees F.

D. Protect roll materials from damage by storing on end.

E. Do not double stack pallets.

1.07 FIELD CONDITIONS

A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

1.08 SEQUENCING AND SCHEDULING

A. Install flooring and accessories after the other finishing operations, including painting, have been completed. Close spaces to traffic during the installation of the flooring.

B. Do not install flooring over concrete slabs until they are sufficiently dry to achieve a bond with the adhesive, in accordance with the manufacturer's recommended bond, moisture tests and pH test.

1.09 WARRANTY

A. Resilient Flooring: Submit a written warranty executed by the manufacturer, agreeing to repair or replace resilient flooring that fails within the warranty period.

B. Limited Warranty: 5 years.

C. Limited Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

D. For the Limited Warranty to be valid, this product is required to be installed using the appropriate Armstrong Flooring Guaranteed Installation System. Product installed not using the specific instructions from the Guaranteed Installation System will void the warranty.

PART 2 PRODUCTS

2.01 TILE FLOORING

A. Vinyl Composition Tile (VCT): Homogeneous, with color extending throughout thickness.
   1. Manufacturers:
      a. Basis of Design: Armstrong Flooring, Inc; Standard Excelon Imperial Texture: www.armstrongflooring.com/#sle.
         1) Contact: Rachel White: 760-936-6758.
      b. Substitutions: See Section 01 60 00 - Product Requirements.
   2. Minimum Requirements: Comply with ASTM F1066, of Class corresponding to type specified.
   3. Size: 12 by 12 inch.
   4. VOC Content Limits: As specified in Section 01 61 16.
   5. Pattern: Monolithic.

6. Color: As indicated on drawings.

B. Luxury Vinyl Tile (LVT)e: Solid vinyl with color and pattern throughout thickness, and:
   1. Manufacturers:
      a. Basis of Design: Shaw Contract, Envelop 4141V: www.shawcontract.com.
         1) Contact: Lisa Kalte: 916-798-7500.
      b. Substitutions: See Section 01 60 00 - Product Requirements.
   2. Minimum Requirements: Comply with ASTM F1700, of Class corresponding to type specified.
   3. Plank Tile Size: 7 by 78 inch.
   4. Wear Layer Thickness: 0.020 inch.
   5. Total Thickness: 0.157 inch.
   6. Pattern: Stagger, direction as shown on plans..
   7. Installation: Direct Glue.
   8. Color: As indicated on drawings.

C. Static Dissipative Tile (SDT): composed of polyvinyl chloride resin, plasticizers, fillers, pigments, and antistatic additive with colors and texture dispersed uniformly throughout its thickness.
   1. Manufacturers:
      a. Basis of Design: Armstrong Flooring; Excelon SDT; www.armstrongflooring.com/#sle.
      b. Substitutions: See Section01 60 00-Product Requirements.
   2. Tile shall meet size, thickness, indentation, impact, deflection, dimensional stability, resistance to chemicals, squareness, and resistance to heat requirements of ASTM F 1066 Standard Specification for Vinyl Composition Tile, Class 2, through pattern.
   3. Size: 12 in x 12 in.
   4. Thickness: 1/8"/0.125 in. (3.2mm).
   5. Color: as indicated on drawings.

2.02 RESILIENT BASE

A. Resilient Base: ASTM F1861, Type TS rubber, vulcanized thermoset; top set Style B, Cove, and as follows:
   1. Manufacturers:
      a. Tarkett: www.commercial.tarkett.com
      b. Burke Flooring; Commercial Wall Base - TS: www.burkeflooring.com/#sle.
      c. Johnsonite, a Tarkett Company: www.johnsonite.com/#sle.
      d. Roppe Corporation; Contours Profiled Wall Base System: www.roppe.com/#sle.
      e. Substitutions: See Section 01 60 00 - Product Requirements.
   2. Height: 4 inch.
   3. Finish: Satin.
   4. Size: Cove profile, rolled goods.
   5. Color: As indicated on drawings.
   6. Accessories: Premolded external corners and internal corners.

2.03 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.

B. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer.
   1. VOC Content Limits: As specified in Section 01 61 16.

C. Adhesive for Vinyl Flooring:
   1. Manufacturers:
      a. H.B. Fuller Construction Products, Inc; TEC Flexera Premium Universal Adhesive: www.tecspecialty.com/#sle.
      b. Loba-Wakol, LLC; WAKOL D 3120 PVC Adhesive: www.loba-wakol.com/#sle.
      c. Stauf USA, LLC; D737 High-Tack: www.staufusa.com/#sle.

d. Substitutions: Section 01 6000 - Product Requirements.

D. Moldings, Transition and Edge Strips: Same material as flooring.

E. Sealer and Wax: Types recommended by flooring manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.

C. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
   1. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

D. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Remove existing resilient flooring and flooring adhesives; follow the recommendations of RFCI (RWP).

B. Remove subfloor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with subfloor filler to achieve smooth, flat, hard surface.

C. Prohibit traffic until filler is fully cured.

D. Clean substrate.

E. Apply primer as required to prevent "bleed-through" or interference with adhesion by substances that cannot be removed.

3.03 INSTALLATION - GENERAL

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install in accordance with manufacturer's written instructions.

3.04 INSTALLATION - TILE FLOORING

A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.

B. Install plank tile with a random offset of at least 6 inches from adjacent rows.

3.05 INSTALLATION - RESILIENT BASE

A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.

B. Miter internal corners. At external corners, use premolded units. At exposed ends, use premolded units.

C. Install base on solid backing. Bond tightly to wall and floor surfaces.

D. Scribe and fit to door frames and other interruptions.

3.06 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's written instructions.

3.07 PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation.

END OF SECTION 09 65 00

SECTION 09 68 13
TILE CARPETING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Carpet tile, fully adhered.

B. Removal and recycling of existing carpet tile.

1.02 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 01 74 19 - Construction Waste Management and Disposal: Reclamation/Recycling of new carpet tile scrap and removed carpet tile.

C. Section 03 30 00 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied flooring.

D. Section 09 05 61 - Common Work Results for Flooring Preparation: Removal of existing floor coverings, cleaning, and preparation.

E. Section 26 05 19.13 - Undercarpet Electrical Power Cables: Undercarpet flat wiring.

1.03 REFERENCE STANDARDS

A. 2019 California Green Building Standatrds Code - Non-Residential Mandatory Measures.

B. ASTM D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials 2016 (Reapproved 2021).

C. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride 2016a.

D. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes 2019a.

E. CRI (GLP) - Green Label Plus Testing Program - Certified Products Current Edition.

F. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source 2019.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.

C. Shop Drawings: Indicate layout of joints.

D. Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.

E. Sustainable Design Submittal: Submit VOC content documentation for adhesives.

F. CalGreen testing and product requirements: Provide documentation indicating compliance with Section 5.504.4.4.

G. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

H. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.

I. Installer's Qualification Statement.

J. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

K. Maintenance Materials: Furnish the following for City's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.

2. Extra Carpet Tiles: Quantity equal to 5 percent of total installed of each color and pattern installed.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet tile with minimum three years documented experience.

B. Installer Qualifications: Company specializing in installing carpet tile with minimum three years documented experience and approved by carpet tile manufacturer.

C. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

1.06 FIELD CONDITIONS

A. Store materials in area of installation for minimum period of 24 hours prior to installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Tile Carpeting:
1. Shaw Contract, Inc: www.shawcontract.com.
2. Interface, Inc.: www.interface.com. Contact: Gwen.Lauridson@interface.com. Ph. 916-206-5529. www.interface.com.
3. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 MATERIALS

A. Tile Carpeting, Type (CPT1): Tufted, manufactured in one color dye lot.
1. Product: Landing Tile 5T373 manufactured by Shaw Contract.
2. Tile Size: 18x36 inch, nominal.
3. Thickness: 0.258 inch.
4. Color: Distant 71505.
5. Pattern: Ashlar.
6. VOC Content: Provide CRI (GLP) certified product; in lieu of labeling, independent test report showing compliance is acceptable.
7. Maximum Electrostatic Charge: 3.5 Kv. at 20 percent relative humidity.
8. Gauge: 1/10 inch.
9. Primary Backing Material: Synthetic.
10. Secondary Backing Material: Ecoworx Tile.
11. Total Weight: 22 oz/sq yd.

B. Tile Carpeting, Type (CPT2): Tufted, manufactured in one color dye lot.
1. Product: Jacquard Tile 5T280 manufactured by Shaw Contract.
2. Tile Size: 18x36 inch, nominal.
3. Thickness: 0.339 inch.
4. Color: Muslin 79516.
5. Pattern: Stagger.
6. VOC Content: Provide CRI (GLP) certified product; in lieu of labeling, independent test report showing compliance is acceptable.
7. Maximum Electrostatic Charge: 3.5 Kv. at 20 percent relative humidity.
8. Gauge: 1/10 inch.
9. Primary Backing Material: Synthetic.
10. Secondary Backing Material: Ecoworx Tile.
11. Total Weight: 28 oz/sq yd.

C. Tile Carpeting, Type (CPT3): Tufted, manufactured in one color dye lot.
1. Product: Landing Tile 5T373 manufactured by Shaw Contract.
2. Tile Size: 18x36 inch, nominal.
3. Thickness: 0.258 inch.

4. Color: Opulent 71555.
5. Pattern: Ashlar.
6. VOC Content: Provide CRI (GLP) certified product; in lieu of labeling, independent test report showing compliance is acceptable.
7. Maximum Electrostatic Charge: 3.5 Kv. at 20 percent relative humidity.
8. Gauge: 1/10 inch.
9. Primary Backing Material: Synthetic.
10. Secondary Backing Material: Ecoworx Tile.
11. Total Weight: 22 oz/sq yd.

D. Tile Carpeting, Type (CPT4): Tufted, manufactured in one color dye lot.
1. Product: Landing Edge Tile 5T375 manufactured by Shaw Contract.
2. Tile Size: 18x36 inch, nominal.
3. Thickness: 0.277 inch.
4. Color: Distant Birch 71500.
5. Pattern: Ashlar.
6. VOC Content: Provide CRI (GLP) certified product; in lieu of labeling, independent test report showing compliance is acceptable.
7. Maximum Electrostatic Charge: 3.5 Kv. at 20 percent relative humidity.
8. Gauge: 1/10 inch.
9. Primary Backing Material: Synthetic.
10. Secondary Backing Material: Ecoworx Tile.
11. Total Weight: 22 oz/sq yd.

E. Tile Carpeting, Type (CPT5): Tufted, manufactured in one color dye lot.
1. Product: Jacquard Tile 5T280 manufactured by Shaw Contract.
2. Tile Size: 18x36 inch, nominal.
3. Thickness: 0.339 inch.
4. Color: Flax79557.
5. Pattern: Stagger.
6. VOC Content: Provide CRI (GLP) certified product; in lieu of labeling, independent test report showing compliance is acceptable.
7. Maximum Electrostatic Charge: 3.5 Kv. at 20 percent relative humidity.
8. Gauge: 1/10 inch.
9. Primary Backing Material: Synthetic.
10. Secondary Backing Material: Ecoworx Tile.
11. Total Weight: 28 oz/sq yd.

2.03 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by flooring material manufacturer.

B. Edge Strips: Embossed aluminum, color as selected by Architect.

C. Adhesives:
1. Compatible with materials being adhered; maximum VOC content as specified in Section 01 61 16.

D. Carpet Tile Adhesive: Recommended by carpet tile manufacturer; releasable type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that subfloor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.

B. Cementitious Subfloor Surfaces: Verify that substrates are ready for flooring installation by testing for moisture and alkalinity (pH).
1. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.

3.02 PREPARATION

A. Remove existing carpet tile.

B. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

C. Remove subfloor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with subfloor filler.

D. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.

E. Vacuum clean substrate.

3.03 INSTALLATION

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install carpet tile in accordance with manufacturer's instructions.

C. Blend carpet from different cartons to ensure minimal variation in color match.

D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.

E. Lay carpet tile in square pattern, with pile direction parallel to next unit, set parallel to building lines.

F. Locate change of color or pattern between rooms under door centerline.

G. Fully adhere carpet tile to substrate.

H. Trim carpet tile neatly at walls and around interruptions.

I. Complete installation of edge strips, concealing exposed edges.

3.04 CLEANING

A. Remove excess adhesive without damage, from floor, base, and wall surfaces.

B. Clean and vacuum carpet surfaces.

3.05 RECYCLING OF EXISTING CARPET

A. Recycling of existing carpet is required. See:

1. California Carpet Stewardship Program: https://carpetrecovery.org/california/ca for drop off locations.

END OF SECTION 09 68 13

SECTION 09 72 00
WALL COVERINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Wall covering, graphics, custom prints, and murals.

1.02 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. 09 21 16 - Gypsum Board Assemblies.

1.03 REFERENCE STANDARDS

A. 2019 California Green Building Standatrds Code - Non-Residential Mandatory Measures.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2021a.

C. ASTM F793/F793M - Standard Classification of Wall Coverings by Use Characteristics 2015.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on wall covering and adhesive.

C. Shop Drawings: Indicate wall elevations with seaming layout.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Inspect roll materials at arrival on site, to verify acceptability.

B. Protect packaged adhesive from temperature cycling and cold temperatures.

C. Do not store roll goods on end.

1.07 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the adhesive or wall covering product manufacturer.

B. Maintain these conditions 24 hours before, during, and after installation of adhesive and wall covering.

PART 2 PRODUCTS

2.01 WALL COVERINGS

A. Wall Covering - Type 1 (first Floor, Building 2)
   1. Manufacturer
      a. Basis of Design: takeform, 11601 Maple Ridge Rd, Medina NY 14103; Amplify Pebble PU-201: https://www.takeform.net/products/amplify/wallcoverings.
      b. Substitutions: See Section01 60 00-Product Requirements.
   2. General Requirements:
      a. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84.
      b. Use: Indoor only.
      c. Material: Terralon (polyester/ natural fiber).

d. Texture: Medium.
e. Thickness: 22 mil (14 oz).
f. Roll Width: 54".
g. Installation Method: Standard commercial wallcovering pastes, primers and techniques.
h. Classification: Type II.
i. Mold/ Mildew: ASTM-G21 specifications; complies with all requirements.
j. Sustainability:
    1) PVC & POA (Olefin) free;
    2) No plasticizers, phthalates, formaldehyde, chlorine, halogen, heavy metals or ozone depleting chemicals;
    3) 31% post consumer recycled content (minimum);
    4) Recyclable, no offgassing;
    5) Made with 100% water based adhesives.
k. Chemical Resistance: Resists mild alkalis, mild acids, water.
l. Maintenance: Clean with mild dish soap and water.

B. Wall Covering - Type 2 (WP1): See Interiors Finish Schedule.
1. Manufacturer
    a. Basis of Design: Korogard. https://www.koroseal.com. Contact: Lurline Hodnett 559-250-2430.
    b. Substitutions: See Section01 60 00-Product Requirements.
2. Comply with ASTM F793/F793M, Category V, Type II.
3. Total Thickness: 0.71 mil (0.040 inch).
4. Color: Silver Metallic..
5. Fire Rating: Class A.

C. Adhesive: Type recommended by wall covering manufacturer to suit application to substrate.

D. Termination Trim: Extruded plastic, clear.

E. Substrate Filler: As recommended by adhesive and wall covering manufacturers; compatible with substrate.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are prime painted and ready to receive work, and comply with requirements of wall covering manufacturer.

B. Measure moisture content of surfaces using an electronic moisture meter. Do not apply wall coverings if moisture content of substrate exceeds level recommended by wall covering manufacturer.

C. Verify flatness tolerance of surfaces does not vary more than 1/8 inch in 10 feet nor vary at a rate greater than 1/16 inch/ft.

3.02 PREPARATION

A. Fill cracks in substrate and smooth irregularities with filler; sand smooth.

B. Wash impervious surfaces with tetra-sodium phosphate, rinse and neutralize; wipe dry.

C. Surface Appurtenances: Remove or mask electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.

D. Vacuum clean surfaces free of loose particles.

E. Normalize to room conditions for 48 hours prior to installation.

3.03 INSTALLATION

A. Apply adhesive and wall covering in accordance with manufacturer's instructions.

B. Apply adhesive to wall surface immediately prior to application of wall covering.

C. Apply wall covering smooth, without wrinkles, gaps or overlaps. Eliminate air pockets and ensure full bond to substrate surface.

D. Butt edges tightly.

E. Install wall covering before installation of bases and items attached to or spaced slightly from wall surface.

F. Do not install wall covering more than 1/4 inch below top of resilient base.

G. Apply wall covering to electrical wall plates prior to replacing.

H. Where wall covering tucks into reveals, or metal wallboard or plaster stops, apply with contact adhesive within 6 inches of wall covering termination. Ensure full contact bond.

I. Install termination trim.

J. Remove excess adhesive while wet from seam before proceeding to next wall covering sheet. Wipe clean with dry cloth.

3.04 CLEANING

A. Clean wall coverings of excess adhesive, dust, dirt, and other contaminants.

B. Reinstall wall plates and accessories removed prior to work of this section.

3.05 PROTECTION

A. Do not permit construction activities at or near finished wall covering areas.

3.06 SCHEDULES

A. See Signage Plan Sheet A2-151 for Wallcovering Type 1.

B. See Interiors Finish Schedule for Wallcovering Type 2.

END OF SECTION 09 72 00

This page intentionally left blank

SECTION 09 72 60
TACKABLE WALLCOVERING

PART 1 - GENERAL

1.01 SECTION INCLUDES:

A. Resilient cork/linoleum tackable wallcovering.

B. Accessories.

1.02 SUBMITTALS

A. Provide MSDS or other manufacturer documentation with disclosure of VOC content for all wet-applied products.

B. Comply with Section 01 30 30.

C. Product data indicating compliance with specified requirements.

D. Installation Instructions.

E. Samples: 6 X 9 inch (150 x 225 mm) samples of each type of tackable wallcovering material required.

1.03 REFERENCE STANDARDS

A. 2019 California Green Building Standatrds Code - Non-Residential Mandatory Measures.

1.04 QUALITY ASSURANCE

A. Fire Performance Characteristics: Comply with fire performance characteristics indicated below. Identify components with markings from testing and inspection organization.
   1. ASTM E 84 (Fuel contribution) - Class B
   2. NFPA253 (Critical Radiant Flux) - Class II

B. Single Source Responsibility: Obtain tackable wallcovering system components from a single source.

C. Deliver materials in original factory packaging, labeled with manufacturer, brand name, size, color, and lot number.

D. Store materials in original, undamaged packaging inside a well-ventilated area protected from weather, moisture, soiling, and extreme temperatures. from weather, moisture, soiling, and extreme temperatures.

E. Maintain room temperature within the storage area at not less than68 degrees Fahrenheit (20 degrees Celsius) during the period materials are stored.

F. Mock-ups: Prepare mock-ups for architect's review and to establish requirements for seaming and finish trim.
   1. Correct areas, modify method of application/installation, or adjust finish texture as directed by architect to comply with specified requirements.
   2. Maintain mock-ups accessible to serve as a standard of quality.
   3. Install sample panel of each type of wallcovering specified.
   4. Install panels in areas designated by architect.

1.05 PROJECT CONDITIONS

A. Maintain ambient temperature within the building at not less than 68 degrees Fahrenheit (20 degrees Celsius) for a minimum of seventy-two hours prior to beginning of installation.
   1. Do not install tackable wallcovering until the space is enclosed and weatherproof.
   2. Do not install tackable wallcovering until temperature is stabilized and permanent lighting is in place.

1.06 MAINTENANCE

A. Maintenance Instructions: Include precautions against cleaning materials and methods that may be detrimental to finishes and performance.

B. Extra Materials: Deliver to Owner extra materials from same production run as installed products. Package with protective materials.

1.07 WARRANTY

A. Submit manufacturer's limited five-year written warranty against manufacturing defects.

PART 2 - PRODUCTS

2.01 PRODUCTS

A. Basis of Design: Koroseal "Walltalkers® tac•wall": Uni-color, resilient, homogeneous, tackable linoleum surface consisting of linseed oil, granulated cork, rosin binders, and dry pigments calendared onto natural burlap backing. Color shall extend through thickness of material.

B. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ACCESSORIES

A. Adhesive: Solvent-free, SBR type linoleum adhesive (L-910) or polyvinyl acetate dispersion type (contact adhesive) when used in press.

B. Tack Rail: 1", clear satin anodized aluminum rail with tackable insert.

C. J-Trim for tac•wall:
   1. JTRM-00: Clear satin, anodized aluminum, 1/4 inch profile trim

D. Q-Pins:
   1. WTQP-01: 24 Push Pins Translucent.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas and conditions in which tackable wallcoverings will be installed.

B. Complete finishing operations, including painting, before beginning installation of tackable wallcovering materials.

C. Wall surfaces to receive wallcovering materials shall be dry and free from dirt, grease, loose paint, and scale.

D. Notify the contractor and architect in writing of any conditions detrimental to the proper and timely completion of the installation.

E. Beginning of installation means acceptance of surface conditions.

F. Surface Preparation: Remove hardware, accessories, plates, and similar items to allow tackable wallcovering to be installed.
   1. Gypsum board surface: Recess nails and screws. Repair irregular tape joints, sand and remove dust.
   2. Painted surface: Remove loose paint or scale. Sand surface of enamel or gloss paint and wipe clean with damp cloth.
   3. Prime substrate as recommended by manufacturer.

3.02 PREPARATION

A. Surface Preparation: Remove hardware, accessories, plates, and similar items to allow tackable wallcovering to be installed.

B. Plaster surface: Remove surface chalk. In new work, use moisture meter to determine moisture content. Do not begin installation when moisture content is greater than five percent.

C. Gypsum board surface: Recess nails and screws. Repair irregular tape joints, sand and remove dust.

D. Painted surface: Remove loose paint or scale. Sand surface of enamel or gloss paint and wipe clean with damp cloth.

E. Ensure wall surfaces scheduled to receive tackable wallcovering are properly sealed with a quality primer specified for use under flexible vinyl wallcoverings.

3.03 APPLICATION

A. Comply with manufacturer's printed installation instructions.

B. Cut sheets to size including a few inches of overage. Allow sheets to lay flat for at least twenty-four hours prior to the application. Mark roll direction and sequence on the backside of each sheet. Hang sheets in sequence as cut from the roll, do not reverse sheets.

C. Permanent HVAC system shall be set to 68 degrees Fahrenheit (20 degrees Celsius) for at least seventy-two hours prior to, during, and after the installation.

D. Back roll each sheet prior to the installation to release curl memory.

E. For seamed applications, using a seam and strip cutter remove the factory edge of one sheet. Using the same tool, overlap and trace cut the mating edge of the second sheet. Repeat this step for as many sheets as required for the job.

F. Scribe, cut, and fit material to butt tightly to adjacent surfaces, built-in casework, and permanent fixtures and pipes.

G. Apply adhesive with a 1/16 inch square notch trowel to the area to receiving the sheet (apply enough for one sheet at a time).

H. Work from top to bottom then side to side. Roll sheet firmly into adhesive for positive contact and to remove air bubbles.

I. Remove adhesive residue immediately after each panel is hung with a mild soap/water solution and a soft cloth/sponge.

3.04 CLEANING

A. Clean wallcovering using a sponge with a neutral pH cleaning solution. Do not use abrasive cleaners. Rinse thoroughly with water and let dry before using.

B. Remove excess adhesive using methods and materials recommended by manufacturer.

3.05 PROTECTION

A. Protect installed product and finish surfaces from damage during construction.

END OF SECTION 09 72 60

This page intentionally left blank

SECTION 09 91 13
EXTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
   5. Floors, unless specifically indicated.
   6. Glass.
   7. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 05 50 00 - Metal Fabrications: Shop-primed items.

C. Section 09 91 23 - Interior Painting.

1.03 REFERENCE STANDARDS

A. 2019 California Green Building Standatrds Code - Non-Residential Mandatory Measures.

B. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency current edition.

C. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials 2020.

D. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual Current Edition.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
   2. MPI product number (e.g. MPI #47).
   3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum 5 years experience and approved by manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.07 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the paint product manufacturer's temperature ranges.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide paints and finishes from the same manufacturer to the greatest extent possible.

B. Paints:
   1. Basis of Design Manufacturer: Sherwin-Williams Company; www.sherwin-williams.com/#sle..
   2. PPG Paints: www.ppgpaints.com/#sle.

C. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready-mixed, unless required to be a field-catalyzed paint.
   1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   2. Supply each paint material in quantity required to complete entire project's work from a single production run.
   3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is described explicitly in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content: Comply with Section 01 61 16.

C. Flammability: Comply with applicable code for surface burning characteristics.

2.03 PAINT SYSTEMS - EXTERIOR

A. Paint E-OP - Exterior Surfaces to be Painted, Unless Otherwise Indicated: Including concrete, concrete masonry units, brick, fiber cement siding, primed wood, and primed metal.
   1. Two top coats and one coat primer.
   2. Top Coat(s): Exterior Latex; MPI #10, 11, 15, 119, or 214.

2.04 PRIMERS

A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.
   1. Alkali Resistant Water Based Primer; MPI #3.

2.05 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.

C. Test shop-applied primer for compatibility with subsequent cover materials.

D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
   1. Fiber Cement Siding: 12 percent.
   2. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
   3. Exterior Wood: 15 percent, measured in accordance with ASTM D4442.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

F. Fiber Cement Siding: Remove dirt, dust and other foreign matter with a stiff fiber brush. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.

G. Exterior Wood Surfaces to Receive Opaque Finish: Remove dust, grit, and foreign matter. Seal knots, pitch streaks, and sappy sections. Fill nail holes with tinted exterior calking compound after prime coat has been applied. Back prime concealed surfaces before installation.

3.03 APPLICATION

A. Exterior Wood to Receive Opaque Finish: If final painting must be delayed more than 2 weeks after installation of woodwork, apply primer within 2 weeks and final coating within 4 weeks.

B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

D. Apply each coat to uniform appearance.

E. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

F. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

3.06 COLOR SCHEDULE

A. See finish schedule sheet I1-101.

END OF SECTION 09 91 13

SECTION 09 91 23
INTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
   1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
   2. Surfaces inside cabinets.
   3. Mechanical and Electrical:
      a. In finished areas, paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.
      b. In finished areas, paint shop-primed items.
      c. Paint dampers exposed behind louvers, grilles, and convector and baseboard cabinets to match face panels.

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
   5. Floors, unless specifically indicated.
   6. Glass.
   7. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

1.03 DEFINITIONS

A. Comply with ASTM D16 for interpretation of terms used in this section.

1.04 REFERENCE STANDARDS

A. 2019 California Green Building Standatrds Code - Non-Residential Mandatory Measures.

B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications 2016.

C. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials 2020.

D. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual Current Edition.

E. SSPC-SP 1 - Solvent Cleaning 2015, with Editorial Revision (2016).

F. SSPC-SP 2 - Hand Tool Cleaning 2018.

G. SSPC-SP 6 - Commercial Blast Cleaning 2007.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:

1. Manufacturer's name, product name and/or catalog number, and general product category (e.g., "alkyd enamel").
2. MPI product number (e.g., MPI #47).
3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.

C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
1. Where sheen is specified, submit samples in only that sheen.
2. Where sheen is not specified, discuss sheen options with Architect before preparing samples, to eliminate sheens not required.

D. Manufacturer's Instructions: Indicate special surface preparation procedures.

E. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.

F. Maintenance Materials: Furnish the following for City's use in maintenance of project.
1. See Section 01 60 00 - Product Requirements, for additional provisions.
2. Extra Paint and Finish Materials: 1 gallon of each color; from the same product run, store where directed.
3. Label each container with color in addition to the manufacturer's label.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum 5 years experience and approved by manufacturer.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.08 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide paints and finishes from the same manufacturer to the greatest extent possible.
1. In the event that a single manufacturer cannot provide specified products, minor exceptions will be permitted provided approval by Engineer is obtained using the specified procedures for substitutions

B. Paints:
1. Base Manufacturer: Sherwin-Williams Company: www.sherwin-williams.com/#sle..
2. PPG Paints: www.ppgpaints.com/#sle.
3. Kelly Moore Paints: www.kellymoore.com.

C. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready-mixed, unless intended to be a field-catalyzed paint.
   1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   2. Supply each paint material in quantity required to complete entire project's work from a single production run.
   3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content: Comply with Section 01 61 16.

2.03 PAINT SYSTEMS - INTERIOR

A. Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsum board, concrete, wood, uncoated steel, shop primed steel, galvanized steel, and aluminum.
   1. Two top coats and one coat primer.
   2. Top Coat(s): High Performance Architectural Interior Latex; MPI #138, 139, 140, or 141.
      a. Products:
         1) PPG Paints Pitt-Glaze WB1 Pre-Catalyzed Water-Borne Acrylic Epoxy, 16-310 Series, Eggshell.
         2) Sherwin-Williams Pre-Catalyzed Waterbased Epoxy, Eg-Shel. (MPI #139)
         3) Substitutions: Section 01 60 00 - Product Requirements.
   3. Top Coat Sheen:
      a. Eggshell: MPI gloss level 3; use this sheen at all locations.
      b. Satin: MPI gloss level 4; use this sheen for items subject to frequent touching by occupants, including door frames and railings.
      c. Primer: As recommended by top coat manufacturer for specific substrate.

2.04 PRIMERS

A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.
   1. Alkali Resistant Water Based Primer; MPI #3.
      a. Products:
         1) PPG Paints Seal Grip Interior/Exterior Acrylic Universal Primer/Sealer, 17-921XI Series. (MPI #3)
         2) Sherwin-Williams Loxon Concrete and Masonry Primer Sealer, LX02W50. (MPI #3)
         3) Substitutions: Section 01 60 00 - Product Requirements.
   2. Interior Institutional Low Odor/VOC Primer Sealer; MPI #149.
      a. Products:
         1) PPG Paints Speedhide Zero Interior Latex Sealer, 6-4900XI. (MPI #149)
         2) PPG Paints Pure Performance Interior Latex Primer, 9-900. (MPI #149)
         3) Substitutions: Section 01 60 00 - Product Requirements.
   3. Interior/Exterior Latex Block Filler; MPI #4.
      a. Products:
         1) Kilz Pro-X p50 Block Filler Primer.
         2) PPG Paints Speedhide Masonry Hi Fill Latex Block Filler, 6-15XI . (MPI #4)
         3) Sherwin-Williams ConFlex Block Filler. (MPI #4)
         4) Substitutions: Section 01 60 00 - Product Requirements.
   4. Interior Latex Primer Sealer; MPI #50.
      a. Products:
         1) PPG Paints Speedhide Interior Latex Sealer, 6-2. (MPI #50)

5. Interior Drywall Primer Sealer.
    a. Products:
        1) PPG Paints Speedhide Pro-EV Zero Latex Sealer, 12-900XI.
        2) Substitutions: Section 01 60 00 - Product Requirements.

2.05 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

C. Test shop-applied primer for compatibility with subsequent cover materials.

D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:
    1. Gypsum Wallboard: 12 percent.
    2. Plaster and Stucco: 12 percent.
    3. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
    4. Interior Wood: 15 percent, measured in accordance with ASTM D4442.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

F. Concrete:
    1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.

G. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.

H. Plaster: Fill hairline cracks, small holes, and imperfections with latex patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.

I. Insulated Coverings: Remove dirt, grease, and oil from canvas and cotton.

J. Aluminum: Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.

K. Galvanized Surfaces:
    1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
    2. Prepare surface according to SSPC-SP 2.

L. Ferrous Metal:
    1. Solvent clean according to SSPC-SP 1.

2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
3. Remove rust, loose mill scale, and other foreign substances using using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.

M. Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.

3.03 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

D. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

E. Sand wood and metal surfaces lightly between coats to achieve required finish.

F. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

G. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection.

3.05 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.06 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

3.07 SCHEDULE - PAINT SYSTEMS

A. Gypsum Board: Finish surfaces exposed to view.
1. Interior Ceilings and Bulkheads: GI-OP-3L, flat.
2. Interior Walls: GI-OP-3A, semi-gloss.

B. Wood: Finish surfaces exposed to view.
1. Interior trim and frames: WI-OP-3A, semi-gloss.

C. Steel Doors and Frames: Finish surfaces exposed to view; MI-OP-3A, gloss.

D. Aluminum: Finish surfaces exposed to view.
1. Interior: Mal-OP-3L.

E. Galvanized Steel: Finish surfaces exposed to view.
1. Interior: Mgl-OP-3L.

F. Shop-Primed Metal Items: Finish surfaces exposed to view.
1. Finish the following items:
a. Mechanical equipment.
b. Electrical equipment.

3.08 COLOR SCHEDULE

A. See finish schedule sheet I1-101.

END OF SECTION 09 91 23

SECTION 10 11 00
VISUAL DISPLAY WALL PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Porcelain enamel steel markerboards.

B. Tackable wall panels.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Blocking and supports.

B. Section 06 20 00 - Finish Carpentry: Wood frame and marker rails.

C. Section 09 21 16 - Gypsum Board Assemblies: Concealed supports in metal stud walls.

1.03 REFERENCE STANDARDS

A. ASTM A424/A424M - Standard Specification for Steel, Sheet, for Porcelain Enameling 2018.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2020.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's data on markerboard, trim, and accessories.

C. Shop Drawings: Indicate wall elevations, dimensions, joint locations , special anchor details.

D. Samples: Submit color charts for selection of color and texture of markerboard and trim.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.06 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide five year warranty for markerboard to include warranty against discoloration due to cleaning, crazing or cracking, and staining.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Claridge Products and Equipment, Inc; Profile Frameless Dry Erase Whiteboard: www.claridgeproducts.com/#sle.

B. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 VISUAL DISPLAY UNITS

A. Porcelain Enamel Steel Markerboards:
   1. Color: White.
   2. Size: As indicated on drawings.
   3. Frame Profile: frameless.
   4. Mounting: Invisi-mount.
   5. Accessories: Provide map rail where indicated on drawings.

B. Tackable Wall Panels: Fabric laminated to fiberboard; Factory-fabricated.
   1. Fabric: Vinyl coated fabric.
   2. Color, Pattern, and Texture: As selected from manufacturer's full range.
   3. Backing: Fiber board, 1/2 inch thick, laminated to tack surface.
   4. Surface Burning Characteristics: Flame spread index of 25, maximum, and smoke developed index of 450, maximum, when tested in accordance with ASTM E84.

5. Size: As indicated on drawings.

2.03 MATERIALS

A. Porcelain Enameled Steel Sheet: ASTM A424/A424M, Type I, Commercial Steel, with fired-on vitreous finish.

B. Adhesives: Type used by manufacturer.

2.04 ACCESSORIES

A. Map Rail: Extruded aluminum, manufacturer's standard profile, with cork insert and runners for accessories; 1 inch wide overall , full width of frame.

B. Temporary Protective Cover: Sheet polyethylene, 8 mil thick.

C. Mounting Brackets: Concealed.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that internal wall blocking is ready to receive work and positioning dimensions are as indicated on shop drawings.

C. Verify flat wall surface for frameless adhesive-applied boards.

3.02 PREPARATION

A. Acclimatize tackable wall panels by removing from packaging in installation area not less than 24 hours before application.

B. Remove switchplates, wall plates, and surface-mounted fixtures where tackable wall paneling is applied. Reinstall items on completion of installation.

C. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Install boards in accordance with manufacturer's instructions.

B. Install with top of marker tray at 30 inches above finished floor.

C. Secure units level and plumb.

D. Butt Joints: Install with tight hairline joints.

E. Carefully cut holes in boards for thermostats.

F. Install tackable wall panels in accordance with manufacturer's recommendations on specified substrates with concealed attachments.

1. Fabricate re-wrapped edges where partial panels about each other, or adjacent surfaces or trim.
2. Re-wrap top, bottom or side edges for cutting panels around door or window openings, abutting trim, protruding objects, and at other openings, including x-cut at receptacles, light switches, and other openings.
   a. Wrap minimum 2 inches around back of panel.
   b. Carefully cut fiber board, leaving vinyl wallcovering intact. Wrap wallcovering tightly around edge of board and adhere continuously around back of panel with manufacturer's recommended vinyl wallcovering adhesive.

3.04 CLEANING

A. Clean board surfaces in accordance with manufacturer's instructions.

B. Cover with protective cover, taped to frame.

C. Remove temporary protective cover at Date of Substantial Completion.

D. Break-in slate chalkboards with a chalk and clean treatment.

END OF SECTION 10 11 00

This page intentionally left blank

SECTION 10 11 33
HORIZONTAL SLIDING UNITS

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. This section includes Horizontal Sliding Markerboard units with visual display boards of the following type:
   1. Porcelain enamel markerboards
   2. Accessories

1.02 RELATED REQUIREMENTS

A. Section 09 21 16 - Gypsum Board Assemblies: Concealed supports in metal stud walls.

B. Section 09 22 16 - Non-Structural Metal Framing: Concealed supports in metal stud walls.

1.03 REFERENCED STANDARDS

A. ASTM-E 84 -Standard Test for Surface Burning Characteristics of Building materials; 2020.

B. ASTM B221 - Standard Specifications for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wires, Profiles, and Tubes; 2014.

1.04 SUBMITTALS

A. Shop Drawings: Provide shop drawings for each horizontal sliding unit required.

B. Product Data: Provide technical data for materials specified. Include Material Safety Data Sheets, when applicable.

C. Samples:
   1. Manufacturer's color charts.
   2. Composition samples of face, core, backing material and trim to illustrate finish, color and texture.

1.05 OPERATION & MAINTENANCE

A. Include data on regular cleaning, stain removal, and precautions.

1.06 REGULATORY REQUIREMENTS

A. Conform to applicable code for flame/smoke rating in tackboards in accordance with ASTM-E 84.

1.07 QUALITY ASSURANCE

A. Manufacturer with at least 5 years experience in the manufacture of the products specified. Obtain signs from one source and a single manufacturer.

B. Installer with at least 5 years experience in the installation of the products specified.

1.08 FIELD CONDITIONS

A. Field measure prior to preparation of shop drawings and fabrication to ensure proper fit.

1.09 WARRANTY

A. Submit a "Life of the Building" warranty, stating that under normal usage and maintenance, and when installed in accordance with manufacturer's instructions and recommendations, Claridge porcelain enamel steel chalkboard and markerboard writing surfaces are guaranteed for the life of the building. Guarantee covers replacement of defective boards but does not include cost of removal or reinstallation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Horizontal Sliding Chalkboard units - as manufactured by: Claridge Products and Equipment, Inc.: Harrison, Arkansas 72602-0910; Phone: 870-743-2200.

B. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 MATERIALS

A. Horizontal Sliding Chalkboard/Markerboard Units
   1. Series:three-track; bottom mounted panels without housing.
      a. Sliding Panels and/or Back Panel - Writing surface:
         1) Porcelain enamel steel Markerboard
         2) Porcelain enamel steel Chalkboard
   2. Sizes: 4 feet 0 inches wide by 8 feet 10 inches high.
   3. Typical Arrangements: Brilliant white, five and three sliding panels see sheets A1-101 & A1-423.
   4. Component Parts: Bottom mounted panels without housing.

B. Metal Trim and Accessories: Provide aluminum extrusions as manufactured by Claridge Products and Equipment, Inc. Frame and exposed members shall be heavy gauge extruded aluminum and shall meet or exceed ASTM B221 Alloy Standards.
   1. Finish: Etched and anodized satin finish.
   2. Chalktrough: Standard continuous, solid type aluminum accessory tray with ribbed section and injection molded end closures.

C. Colors: As selected from manufacturer's standard colors. Color charts furnished on request.

D. Adhesive: As recommended by manufacturer.

2.03 FABRICATION

A. Shop assembly: Provide Horizontal Sliding Units with all corners reinforced with angles to strengthen frame. Nylon ball bearing rollers at top of unit and nylon guide rollers at bottom of unit to be of sufficient size and number to eliminate vibration and provide smooth and quiet operation of the panels
   1. Porcelain Markerboard or Chalkboard:
      a. Sliding Panels:
         1) Face Sheet: Porcelain Enamel Steel
         2) Core: 1/2" honeycomb
         3) Backing: steel
      b. Back Panels:
         1) Face Sheet: Porcelain Enamel Steel
         2) Core: 7/16” MDF (Medium Density Fiberboard)
         3) Backing: Moisture Barrier Back

PART 3 - EXECUTION

3.01 PROJECT CONDITIONS

A. Verify before installation that interior moisture and temperature approximate normal occupied conditions.

B. Verify that wall surfaces are prepared and ready to receive boards.

3.02 INSTALLATION

A. Deliver factory built units completely assembled and of dimensions shown in details and in accordance with manufacturer's shop drawings as approved by the architect.

B. Follow manufacturer's instructions for storage and handling of units before installation.

C. Install level and plumb, keeping perimeter trim straight in accordance with manufacturer's recommendations.

D. Do not install boards on damp walls or in damp and humid weather without heat in the building.

3.03 ADJUST AND CLEAN

A. Verify that all accessories are installed as required for each unit.

B. At completion of work, clean surfaces and trim in accordance with manufacturer's recommendations, leaving all materials ready for use.

END OF SECTION 10 11 33

This page intentionally left blank

SECTION 10 12 00
DISPLAY CASES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface-mounted display cases.

1.02 RELATED REQUIREMENTS

A. Section 09 21 16 - Gypsum Board Assemblies: Concealed supports in metal stud walls.

B. Section 09 22 16 - Non-Structural Metal Framing: Concealed supports in metal stud walls.

1.03 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum 2014 (2015 Errata).

B. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes 2020.

C. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric) 2013.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2020.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit complete printed data and installation details indicating products to be provided as specified.

C. Shop Drawings: Submit complete installation details. Include dimensioned elevations.

D. Samples: Submit samples of material and trim to illustrate finish, color, and texture.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least three years of documented experience.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver display cases and materials to the Project site with manufacturer’s protective crate covering and do not open until ready for use.

B. Protect display cases before, during, and after installation. In case of damage, immediately provide necessary repairs and replacements.

1.07 FIELD CONDITIONS

A. Field Measurements: Verify field measurements for recessed application for display cases before preparation of shop drawings and before fabrication to ensure proper installation.

1.08 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Provide five year manufacturer warranty against defects and in materials, finish product and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Claridge Products and Equipment, Inc; Contemporary Series Bulletin Board Cabinet: www.claridgeproducts.com/#sle.

B. MooreCo, Inc: www.moorecoinc.com/#sle.

C. Nelson Adams NACO: www.nelsonadamsnaco.com/#sle.

2.02 DISPLAY CASES

A. Surface-Mounted Display Case: Factory-fabricated aluminum-framed display case with adjustable glass shelves, finished interior.
   1. Width: 3 feet.
   2. Height: 4 feet.
   3. Components:
      a. Glazed Doors: Hinged.
         1) Number of Doors: Two pair.
   4. Mounting: z-bar hangers, secure directly to aluminum existing storefront mullion with tamper resistant fasteners.

2.03 COMPONENTS

A. Glazed Hinged Doors:
   1. 3/16 inch clear tempered glass framed with 1-1/2 inch by 3 inch extruded aluminum trim.
   2. Hinges: 1 inch by .040 inch nickel-plated steel-continuous piano hinges.
   3. Lock: flat key tumbler lock.

2.04 MATERIALS

A. Aluminum Extrusions for Framing and Trim: Alloy as recommended by manufacturer for construction and specified finish; nominal 1/8 inch wall thickness.

B. Aluminum Extrusions: ASTM B221 (ASTM B221M), 6063 alloy, T5 temper.
   1. Finish: Factory anodized; AAMA 611: Clear anodized.

PART 3 EXECUTION

3.01 PREPARATION

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Locate fastening devices to secure cases securely to back and sides of rough opening.

C. Refer to drawings for display case mounting heights.

3.03 ADJUSTING AND CLEANING

A. Verify that all accessories are installed as detailed for each unit.

B. At completion of work, clean glass surfaces, back panels and trim in accordance with manufacturer’s recommendations leaving units ready for use.

END OF SECTION 10 12 00

SECTION 10 14 00
SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Primary and secondary directories, directionals, room identification, and signage for ADA and life safety code compliance.

B. Interior directional and informational signs.

C. Emergency evacuation maps.

D. Building identification signs.

E. Exterior monument cabinet type.

F. Signage Schedule.

1.02 RELATED REQUIREMENTS

A. Division 1: Administrative, procedural and temporary work requirements.

1.03 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines current edition.

B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.

C. ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.

C. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.
   1. When room numbers to appear on signs differ from those on drawings, include the drawing room number on schedule.
   2. When content of signs is indicated to be determined later, request such information from City through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
   3. Submit for approval by City through Architect prior to fabrication.

D. Approval drawings showing materials, construction detail, size, lay-out, copy, mounting templates and mounting and anchoring detail.

E. Samples: Submit two samples of each type of sign, of size similar to that required for project, illustrating sign style, font, and method of attachment.

F. Selection Samples: Where colors are not specified, submit two sets of color selection charts or chips.

G. Verification Samples: Submit samples showing colors specified.

H. Manufacturer's Installation Instructions: Include installation templates and attachment devices.

1.05 QUALIFICATIONS

A. Manufacturer with at least 5 years experience in the manufacture of the products specified. Obtain signs from one source and a single manufacturer.

B. Installer with at least 5 years experience in the installation of the products specified.

C. All signge to be provided by same manufacturer.

1.06 WARRANTY

A. Provide manufacturer's warranty against defects in materials and workmanship for minimum 2 years.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Package signs as required to prevent damage before installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of design:
   1. Takeform: www.takeform.net.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 SIGNAGE STANDARDS

A. Provide exterior signage in accordance with Architect's drawings and specifications.

B. It is the intent of these specifications to establish an exterior sign standard for the Owner including primary identity, secondary identity, wayfinding and DOT signage. While the Owner may not obtain all signs and sign types, the signage contractor shall design and submit approval drawings for all.

C. It is the intent of these specifications that exterior and interior signage have a matching appearance providing an integrated look and creating a unifying element both within buildings and on campus.

2.03 SIGNAGE APPLICATIONS

A. Accessibility Compliance: Signs are required to comply with ADA Standards and ICC A117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.

B. Room and Door Signs:
   1. Basis of Design: "Vivid" as manufactured by Takeform or approved equal.
   2. The signage shall be a direct print acrylic sign system with applied graphics including all tactile requirements in adherence to ADA specifications.
   3. All signs, including work station and room ID's, overheads and flag mounts, directionals and directories shall have a matching appearance and constructed utilizing the same manufacturing process to assure a consistent look throughout.
   4. Within the signage system shall be signs with capabilities as follows:
      a. Signs with raised copy capable of accepting images in designated image areas and changeable printed inserts.
      b. Signs with raised copy and Braille with changeable printed insert
      c. Signs with raised copy and Braille only
   5. The entire sign shall be 65% post industrial waste and 100% recyclable.
   6. Location: as shown on drawings.

C. Interior Directional and Informational Signs:
   1. Sign Type: Same as room and door signs.
   2. Rated for exterior use where located outside.
   3. Location: as shown on drawings.

D. Emergency Evacuation Maps:
   1. Allow for one map per elevator lobby.
   2. Map content to be provided by City.
   3. Sign Type: Same as room and door signs.

E. Dimensional Letters:
   1. Use individual metal letters.
   2. Mount on exterior or interior wall in location shown on drawings.

F. Vinyl on glazing or finished wall:
   1. Location: Location: as shown on drawings.
   2. Basis of Design: SignGold Flourentine vinyl with 1/8" thick black vinyl edging.

G. Fire Extinguisher Hall Location Signs:
   1. Basis of Design: Vivid as manufacturered by Takeform.
   2. Mount adjacent to each fire extinguisher cabinet per Signage Plans.

2.04 DIRECT PRINT ACRYLIC SIGN SYSTEM

A. Manufacturer:
   1. Basis of Design: Vivid as manufacturered by Takeform.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

B. The signage shall be a direct print acrylic sign system with applied graphics including all tactile requirements in adherence to ADA specifications.

C. All signs, including work station and room ID's, overheads and flag mounts, directionals and directories shall have a matching appearance and constructed utilizing the same manufacturing process to assure a consistent look throughout.

D. Within the signage system shall be signs with capabilities as follows:
   1. Signs with raised copy capable of accepting images in designated image areas and changeable printed inserts.
   2. Signs with raised copy and Braille with changeable printed insert
   3. Signs with raised copy and Braille only
   4. The entire sign shall be 65% post industrial waste and 100% recyclable.

E. Materials:
   1. Signage shall be fabricated of acrylic, .375” thick, comprised of two layers. Edges shall be smooth without chips, burrs, sharp edge or marks. The direct print shall be second surface or underside of the top layer to prevent scratching, fading or other damage. A top-side print shall not be accepted.
   2. Acrylic shall be non-glare optically clear with a P99 finish assuring no loss of clarity or composition of the print.
   3. Tactile lettering shall be precision machined, raised 1/32", matte PETG and subsurface colored for scratch resistance.
   4. The signage shall utilize an acrylic sphere for Grade II Braille inserted directly into a scratch resistant, acrylic face. Braille dots are to be pressure fit in high tolerance drilled holes. Braille dots shall be half hemispherical domed and protruding a minimum 0.025".
   5. The signage shall utilize a pressure activated adhesive. The adhesive shall be nonhazardous and shall allow for flexing and deflection of the adhered components due to changes in temperature and moisture without bond failure.
   6. Signage shall have an acrylic shim plate. The shim shall lift the sign off the wall to facilitate cleaning and painting without sign removal.
   7. All signs shall be provided with appropriate mounting hardware. All hardware shall have a polished anodized finish, architectural in appearance and suitable for the mounting surface.
   8. Some signs may be installed on glass. A blank backer is required to be placed on the opposite side of the glass to cover tape and adhesive. The backer shall match the sign in size and shape.

F. Colors, Patterns, Imagery and Artwork:
   1. Vendor shall provide an online library of images including patterns, graphics and photography. The library shall be organized by idea or theme to facilitate the selection of images appropriate for the project.
   2. All images shall have a minimum resolution of 300 dpi.
   3. Face and background colors shall be per the drawings.

4. Standard tactile colors shall match manufacturer's ADA standard color selection. Font and font colors shall be per the drawings.

G. Printed Inserts:
1. The signage shall be capable of accepting paper inserts to allow changing and updating as required. Insert components shall have a 0.040” thickness non-glare acrylic window and shall be flush to sign face for a smooth, seamless appearance.
2. The signage contractor shall provide and install all signage inserts.
3. Manufacturer shall provide a template containing layout, font, color, artwork and trim lines to allow Owner to produce inserts on laser or ink jet printer. The template shall be in an Acrobat or Word format (.pdf).

2.05 NON-TACTILE SIGNAGE MEDIA

A. Vinyl on exterior glazing at exterior storefronts and on existing awning glazing. See drawings for locations.

B. Vinyl on interior glazing and finished walls.
1. See drawings for locations.

2.06 DIMENSIONAL LETTERS

A. Manufacturer:
1. Basis of Design: "Ethos" as manufacturered by Takeform.
2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Letter Standards:
1. General: Comply with requirements indicated for type, style, colors, finish, letter height, thickness and mounting methods.

C. Letter type: Painted Acrylic.
1. Typeface: see drawings.
2. Color and Finish: see drawings.
3. Letter Height: see drawings.
4. Letter Thickness: see drawings.
5. Mounting Method: all fasteners shall be concealed. See drawings for mounting position and method.

2.07 CABINET TYPE (MONUMENT) PRIMARY AND SECONDARY IDENTITY

A. Manufacturer:
1. Basis of Design: "Signify" as manufacturered by Takeform.
2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Signs shall be welded aluminum frame construction, with removable and updateable sign face and 3 step protective paint process. Refer to drawings for sizes, sign types, colors, finishes, copy, lay-out, letter-style, single or double-sided, and mounting requirements.

C. Typography:
1. Letter style: refer to drawings. Copy shall be a true, clean and accurate representation of typeface(s) specified. Upper and lower case or all caps as indicated on drawings. Letter spacing to be normal and interline spacing shall be set by manufacturer.
2. Arrows, symbols and logo art: to be provided in style, sizes, colors and spacing as indicated on drawings.

D. Sign Types, Colors and Finishes:
1. Sign types and sizes: refer to drawings.
2. Colors and finishes: refer to drawings.
3. Lay-out and typography: refer to drawings.
4. Mounting details: refer to drawings.

E. Materials and Construction:

1. All signs, primary identity, secondary identity, and wayfinding signage shall have a matching appearance and constructed utilizing the same materials and manufacturing process to ensure a consistent look throughout.
2. Signs shall be welded all-aluminum frame construction. Signs utilizing steel components shall not be accepted. Wall thickness shall be minimum of .125". Cabinet face shall be reinforced with concealed stiffeners to preclude buckling, distortion or oil-canning. Posts shall be aluminum 6063 grade, square with no corner radii. Wall thickness of the posts shall be .125".
3. Welded connections shall comply with AWS standards for recommended practices. Provide welds behind finished surfaces without distortion or discoloration of exposed side. Clean exposed welded surfaces of welding flux and dress exposed surfaces.
4. Joints shall be milled to tight, hairline fit. Joints shall not allow water penetration.
5. Signage cabinet shall have removable panels on the sign face to facilitate copy changes and for ease of access to internal lighting. The quantity of removable panels per sign face shall be indicated on the drawings.
6. The sign face shall have no exposed fasteners. No rivets, screws and fasteners shall be visible on face.
7. Illuminated signs shall utilize 120 VAC standard T12 fluorescent bulbs and shall be spaced to ensure a consistent and even distribution of light without "hot or cold spots".
8. Signs shall be preassembled at the factory with no or minimal reassembly at the project site.
9. Signs shall be flange mounted to concrete base allowing removal of sign and reuse of foundation. Electrical location and hardwire connection shall be provided by Owner. All signs shall be provided with appropriate mounting hardware. All exposed hardware shall be stainless steel.

F. Finishing:
1. Signs shall utilize Akzo Nobel Grip-Guard Basecoat/Clearcoat paint system or approved equal: paint finish shall consist of an etching primer applied to a sanded surface as a first coat, followed by the color coat and lastly, a protective clear coat that provides scratch resistance, abrasion resistance, weather resistance and UV inhibitors.
2. Face/background color shall be standard grade, and shall match manufacturer's standard color selection, all colors and finishes.
3. Paint: PMS colors as specified are to be matched according to the numbers specified from the PANTONE Color Selector 1000/Coated (or approved equal).

G. Construction:
1. Design exterior signs to withstand wind loads as calculated in accordance with applicable building code:
   a. Design wind load: as required by municipal code.
   b. Safety factor: 1.5 times design wind load.
2. Frame and Enclosure:
   a. Design, construct, and install structural and non-structural support framing in conformance with applicable building code and ANSI Standards.
   b. Design to allow for thermal movements of components resulting from a maximum change (range) of 120 deg F in ambient temperature and 180 deg F in surface temperatures without buckling, opening of joints, overstressing components, or failure of connections.
   c. Seismic Loads: design and size components to withstand seismic loads and sway displacement per applicable building code.
3. Sign faces to be impact resistant, and produce no noticeable color change for 5 years.

2.08 ACCESSORIES

A. Concealed Screws: Stainless steel, galvanized steel, chrome plated, or other non-corroding metal.

B. Exposed Screws: Chrome plated.

PART 3 EXECUTION

3.01 SITE VISITS

A. Site visits – 3 site visits shall be required by the sign contractor:
   1. Prior to submission of bid for site assessment and evaluation.
   2. Post award for the purposes of meeting with Owners and project manager.
   3. Final walk-through and punchlist.

3.02 CODE COMPLIANCE

A. It shall be the responsibility of the successful bidder to meet any and all local, state, and federal code requirements in fabricating and installing signs.

3.03 DELIVERY, STORAGE, PROTECTION

A. Package to prevent damage or deterioration during shipment, handling, storage and installation. Products should remain in original packaging until removal is necessary. Store products in a dry, indoor location.

3.04 EXAMINATION

A. Installer shall examine signs for defects, damage and compliance with specifications. Installation shall not proceed until unsatisfactory conditions are corrected.

3.05 EXCAVATION AND INSTALLATION - EXTERIOR CABINET TYPE

A. General: Installation locations shall be in accordance with drawings. Locate signs where indicated using mounting methods in compliance with manufacturer's written instructions:
   1. The signage contractor shall coordinate installation schedules with the Owner and/or Construction Manager.
   2. Installation shall be performed by manufacturer's personnel trained and certified in manufacturer's methods and procedures.
   3. Excavate for sign foundation to elevations and dimensions indicated.
   4. Set anchor bolts and other embedded items required for installation of signs using manufacturer supplied templates.
      a. Protect portion of posts above ground from concrete splatter.
   5. Locate signs and accessories where indicated, using mounting methods of types described and complying with manufacturer's written instructions.
      a. Install signs level, plumb, and at heights indicated, with sign surfaces free of distortion and other defects in appearance.
      b. Use non-removable mechanical fasteners placed through predrilled holes. Attach signs with fasteners and anchors suitable for secure attachment to substrate as recommended in writing by sign manufacturer. All visible hardware shall be stainless steel.

3.06 CLEAN UP

A. Contractor shall keep the project site free from accumulation of waste materials and debris generated by his operation, by removing debris at least once a day. Equipment shall not be left on site without prior approval of construction office.

B. Upon completion of work, debris and equipment are to be removed from the site leaving the area clean.

3.07 STANDARDS MANUAL

A. Manufacturer shall provide a comprehensive Standards Manual in both a paper and PDF format. The manual shall include all renderings, drawings, site plan, message schedule and mounting detail.

END OF SECTION 10 14 00

SECTION 10 21 13.17
PHENOLIC TOILET COMPARTMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Floor mounted overhead braced "gap free" phenolic toilet compartments.

B. Wall mounted urinal screens.

C. Compact Laminate (CL Phenolic) Moisture Resistant Substrate: (Bobrick DuraLineSeries).
   1. Toilet partitions.
   2. Urinal privacy screens.

1.02 RELATED REQUIREMENTS

A. Section 05 50 00 - Metal Fabrications: Concealed steel support members.

B. Section 06 10 00 - Rough Carpentry: Blocking and supports.

C. Section 05 50 00 - Metal Fabrications.

D. Section 06 10 00 - Rough Carpentry.

E. Section 09 33 00 - Tiling.

F. Section 09 51 23 - Acoustical Ceilings.

G. Section 10 28 13.19 - Toilet Accessories.

1.03 REFERENCE STANDARDS

A. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar 2015.

B. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth 2019.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the work with placement of support framing and anchors in walls and ceilings.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on panel construction, hardware, and accessories.

C. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall supports, door swings.

D. Samples: Submit two samples of partition panels, 4 x 4 inch minimum in size illustrating panel finish, color, and sheen.

E. Submit under provisions of Section 01 30 00 - Administrative Requirements.

F. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

G. USA Certificate of Origin: Manufacturer shall supply with first submittal, an example of their Certificate of Origin declaring toilet compartments are wholly manufactured and assembled specifically in the United States, including city and state locations. A notarized Certificate of Origin shall be provided with closeout documents.

H. Shop Drawings: Submit manufacturer's shop drawings for each product specified, including the following:
   1. Plans, elevations, details of construction and attachment to adjacent construction.
   2. Show anchorage locations and accessory items.

3. Verify dimensions with field measurements prior to final production of toilet compartments.

I. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

J. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square representing actual product, color, and patterns.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum 10 year experience manufacturing similar products.

B. Installer Qualifications: Minimum 2 year experience installing similar products.

C. Single Source Requirements: To the greatest extent possible provide products from a single manufacturer.

D. Accessibility Requirements: Comply with requirements applicable in the jurisdiction of the project, including but not limited to ADA and ICC/ANSI A117.1 requirement as applicable.

E. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
1. Finish areas designated by Architect.
2. Do not proceed with remaining work until workmanship is approved by Architect.
3. Refinish mock-up area as required to produce acceptable work.

1.07 PRE-INSTALLATION MEETINGS

A. Convene minimum two weeks prior to starting work of this section.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products in manufacturer's unopened packaging bearing the brand name and manufacturer's identification until ready for installation.

B. Handling: Handle materials to avoid damage.

1.09 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.10 WARRANTY

A. Manufacturer's Warranty (DuraLineSeries): Manufacturer's standard 25 year limited warranty for panels, doors, and stiles against breakage, corrosion, delamination, and defects in factory workmanship. Manufacturer's standard 1 year guarantee against defects in material and workmanship for stainless steel door hardware and mounting brackets.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturer: Bobrick Washroom Equipment, Inc., which is located at: 6901 Tujunga Ave.; North Hollywood, CA 91605-6213.

B. Basis of Design Product: Bobrick DuraLine Series 2082G.67P.
1. Substitutions: The Architect will consider products of comparable manufacturers as a substitution, pending the Contractor's submission of adequate documentation of the substitution in accordance with procedures in Division 1 of the Project Manual. Documentation shall include a list of five similar projects of equivalent size where products have been installed for a minimum of two years, and manufacturer's certification that products are fabricated in the United States.
2. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

2.02 PHENOLIC TOILET COMPARTMENTS

A. Compact Laminate (CL Phenolic) Toilet Partitions: Bobrick DuraLine Series.

1. Design Type:
    a. Maximum Height.
        1) Door/Panel Height: 72 inches.
        2) Floor Clearance: 4-5/16 inches.
        3) Panels: Up to 72 inches wide, one piece. Splice or two panels joined by bracket not acceptable.
2. Privacy Style Partitions: No sightlines with gap-free interlocking doors and stiles routed 0.300 inches (7.6 mm) from the edge to allow for 0.175 inch overlap to prevent line-of-sight into the toilet compartment. Privacy strips fastened or adhered onto the partition material are not acceptable.
3. Mounting Configuration:
    a. Floor-to-Ceiling Mounted, extruded anodized aluminum headrails, 0.065 inch thick with anti-grip profile.
        1) Stile Maximum Height: Ceiling height - field verify.

B. Compact Laminate (CL Phenolic) Urinal Screens: Bobrick DuraLineSeries.
1. Mounting Configuration:
    a. Wall-Hung.
        1) Screen Height: 48 inches with 12 inches floor clearance.

C. Materials: Solidly fused plastic laminate with matte-finish melamine surfaces; integrally bonded colored face sheets and black phenolic-resin core.

D. Edges: Black; brown edges not acceptable.

E. Doors shall be self closing at accessible stalls.

F. Color:
1. Color: 0028 Brushed Aluminum.

G. Fire Resistance:
1. National Fire Protection Association/International Building Code Interior Wall and Ceiling Finish: Class B / Uniform Building Code: Class II.
    a. Flame Spread Index (ASTM E 84): 30 for panels and stiles.
    b. Smoke Developed Index (ASTM E 84): 55 for panels, 20 for stiles.

H. Finished Thickness:
1. Stiles and Doors:
2. Panels and Screens: 1/2 inch.

I. Stiles: Floor-Anchored stiles furnished with expansion shields and threaded rods.
1. Leveling Devices: 7 gauge, 3/16 inches thick, corrosion-resistant, chromate-treated, double zinc-plated steel angle leveling bar bolted to stile; furnished with 3/8 inch (10 mm) diameter threaded rods, hex nuts, lock washers, flat washers, spacer sleeves, expansion anchors, and shoe retainers.
2. Stile Shoes: One-piece, 22 gauge, 18-8, Type 304 stainless steel, 4 inch height; tops with 90 degree return to stile. One-piece shoe capable of adapting to 3/4 inch or 1 inch stile thickness and capable of being fastened (by clip) to stiles starting at wall line.

J. Anchors: Expansion shields and threaded rods at floor connections as applicable. Threaded rods secured to supports above ceiling as applicable. Supports above ceiling furnished and installed as Work of Section 05 50 00 - Metal Fabrications.

K. Hardware:
1. Compliance: Operating force of less than 5 lb.
2. Emergency Access: Hinges, latch allow door to be lifted over keeper from outside compartment on inswing doors.
3. Materials: 18-8, Type 304, heavy-gauge stainless steel with satin finish.
4. Doorstops: Prevents inswinging doors from swinging out beyond stile; on outswing doors, doorstop prevents door from swinging in beyond stile.

5. Fastening: Hardware is secured to door and stile with pin-in-head Torx stainless steel machine screws. Hinges, latch and optional door stops secured to door with pin-in-head Torx stainless steel machine screws into factory-installed, threaded brass inserts. Fasteners for hinges, latch and optional door stops secured directly into core not acceptable.
    a. Threaded Brass Inserts: Factory-installed; withstand direct pull force exceeding 1500 lb (680 kg) per insert.
6. Clothes Hooks: Projecting no more than 1-1/8 inch from face of door.
7. Door Latch: Track of door latch prevents inswing doors from swinging out beyond stile; on outswing doors, door keeper prevents door from swinging in beyond stile; 16 gauge sliding door latch, 14 gauge keeper.
8. Locking: Door locked from inside by sliding door latch into keeper.
9. Hinge Type:
    a. Standard.
        1) Balanced, with field-adjustable cam to permit door to be fully closed or partially open when compartment is unoccupied.
10. Mounting Brackets:
    a. Full-Height.
        1) Mounting Brackets: 18 gauge stainless steel and extend full height of panel.
        2) U-Channels: Secure panels to stiles.
            (a) Angle Brackets: Secure stiles-to-walls and panels to walls.

2.03 ACCESSORIES

A. Head Rails: Hollow anodized aluminum, 1 inch by 1-1/2 inch size, with anti-grip profile and cast socket wall brackets.

B. Wall and Pilaster Brackets: Polished stainless steel; manufacturer's standard type for conditions indicated on drawings.

C. Attachments, Screws, and Bolts: Stainless steel , tamper proof type.
1. For attaching panels and pilasters to brackets: Through-bolts and nuts ; tamper proof.
2. Provide full blocking in wall for wall mounted urinal screen mounting.
3. Provide blocking in wall as required for toilet partition attachment.

D. Hardware: Polished stainless steel:
1. Full Height (Continuous) Brackets: Manufacturer’s standard design for attaching panels and screens to walls and pilasters with stainless steel, Type 304, brackets.
2. Hardware and Accessories: Manufacturer’s standard design, heavy duty operating hardware and accessories of stainless steel, Type 304. Provide slide bolts at accessible stalls. Mount coat hooks and bumpers 48 inches above the floor.
3. Overhead Bracing: Manufacturer’s standard continuous, extruded aluminum head rail with antigrip profile in manufacturer’s standard finish.
4. Anchorages and Fasteners: Manufacturer’s standard theft-proof exposed fasteners finished to match hardware.
5. Door Latch: Slide type with exterior emergency access feature.
6. Door strike and keeper with rubber bumper; mounted on pilaster in alignment with door latch.
7. Coat hook with rubber bumper; one per compartment, mounted on door.
8. Provide door pull for outswinging doors.

PART 3 EXECUTION

3.01 PREPARATION

A. Prepare substrates including but not limited to blocking and supports in walls and ceilings at points of attachment using methods recommended by the manufacturer for achieving the best result for the substrates under the project conditions.

1. Inspect areas scheduled to receive compartments for correct dimensions, plumbness of walls, and soundness of surfaces that would affect installation of mounting brackets.
2. Verify spacing of plumbing fixtures to assure compatibility with installation of compartments.

B. If preparation is the responsibility of another installer, notify Architect in writing of deviations from manufacturer's recommended installation tolerances and conditions.

C. Do not proceed with installation until substrates have been properly prepared with blocking and supports in walls and ceilings at points of attachment and deviations from manufacturer's recommended tolerances are corrected. Commencement of installation constitutes acceptance of conditions.

3.02 INSTALLATION

A. Install products in strict compliance with manufacturer's written instructions and recommendations, including the following:
1. Verify blocking and supports in walls and ceilings has been installed properly at points of attachment.
2. Verify location does not interfere with door swings or use of fixtures.
3. Use fasteners and anchors suitable for substrate and project conditions.
4. Install units rigid, straight, plumb, and level.
5. Conceal evidence of drilling, cutting, and fitting to room finish.
6. Test for proper operation.

3.03 ADJUSTING, CLEANING AND PROTECTION

A. Adjust hardware for proper operation after installation. Set hinge cam on in-swinging doors to hold doors open when unlatched. Set hinge cam on out-swinging doors to hold unlatched doors in closed position.

B. Touch-up, repair or replace damaged products.

C. Clean exposed surfaces of compartments, hardware, and fittings.

3.04 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify correct spacing of and between plumbing fixtures.

C. Verify correct location of built-in framing, anchorage, and bracing.

3.05 INSTALLATION

A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.

B. Maintain 3/8 inch to 1/2 inch space between wall and panels and between wall and end pilasters.

C. Attach panel brackets securely to walls using anchor devices.

D. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.

3.06 TOLERANCES

A. Maximum Variation From True Position: 1/4 inch.

B. Maximum Variation From Plumb: 1/8 inch.

3.07 ADJUSTING

A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch.

B. Adjust hinges to position doors in partial opening position when unlatched. Return out-swinging doors to closed position.

C. Adjust adjacent components for consistency of line or plane.

END OF SECTION 10 21 13.17

This page intentionally left blank

SECTION 10 26 00
WALL PROTECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Corner guards.

1.02 RELATED REQUIREMENTS

A. Section 05 50 00 - Metal Fabrications: Corner guards fabricated from rolled metal sections or bent plate.

B. Section 09 21 16 - Gypsum Board Assemblies: Placement of supports in stud wall construction.

1.03 REFERENCE STANDARDS

A. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics 2010 (Reapproved 2018).

B. ASTM F476 - Standard Test Methods for Security of Swinging Door Assemblies 2014.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Indicate physical dimensions, features, wall mounting brackets with mounted measurements, anchorage details, and rough-in measurements.

C. Shop drawings: Include plans showing locations and attachment details.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver wall and door protection items in original, undamaged protective packaging. Label items to designate installation locations.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Corner Guards:
   1. Inpro: www.inprocorp.com/#sle.
   2. Koroseal Interior Products: www.koroseal.com/#sle.
   3. Nystrom, Inc: www.nystrom.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PERFORMANCE CRITERIA

A. Impact Strength: Unless otherwise noted, provide protection products and assemblies that have been successfully tested for compliance with applicable provisions of ASTM D256 and/or ASTM F476.

2.03 PRODUCT TYPES

A. Corner Guards - Flush Mounted:
   1. Material: Type 304 stainless steel, No. 4 finish, 16 gauge, 0.82 inch thick.
   2. Width of Wings: 2 inches.
   3. Corner: Square.
   4. Color: As indicated.
   5. Length: 48".

2.04 FABRICATION

A. Fabricate components with tight joints, corners and seams.

B. Pre-drill holes for attachment.

C. Form end trim closure by capping and finishing smooth.

2.05 SOURCE QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Provide wall and door protection systems of each type from a single source and manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that rough openings, concealed blocking, and anchors are correctly sized and located.

B. Verify that substrate surfaces for adhered items are clean and smooth.

3.02 INSTALLATION

A. Install components in accordance with manufacturer's instructions, level and plumb, secured rigidly in position to supporting construction.

B. Position corner guard 4 inches above finished floor to 52 inches high.

3.03 TOLERANCES

A. Maximum Variation From Required Height: 1/4 inch.

3.04 CLEANING

A. Clean wall and door protection items of excess adhesive, dust, dirt, and other contaminants.

3.05 SCHEDULE

A. As indicated on drawings. See Signage and Dimension Plans for locations.

END OF SECTION 10 26 00

SECTION 10 28 00
TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Commercial toilet accessories.

B. Commercial shower and bath accessories.

C. Under-lavatory pipe supply covers.

D. Electric hand/hair dryers.

E. Diaper changing stations.

F. Utility room accessories.

1.02 RELATED REQUIREMENTS

A. Section 09 30 00 - Tiling: Ceramic washroom accessories.

B. Section 22 40 00 - Plumbing Fixtures: Under-lavatory pipe and supply covers.

1.03 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.

B. ASME A112.18.9 - Protectors/Insulators for Exposed Waste and Supplies on Accessible Fixtures 2011 (Reaffirmed 2017).

C. ASTM C1036 - Standard Specification for Flat Glass 2016.

D. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror 2018.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Commercial Toilet, Shower, and Bath Accessories:
   1. Bobrick: www.bobrick.com.
   2. American Specialties, Inc: www.americanspecialties.com/#sle.
   3. Bradley Corporation: www.bradleycorp.com/#sle.
   4. Georgia-Pacific Professional: www.blue-connect.com/#sle.
   5. Substitutions: Section 01 60 00 - Product Requirements.

B. Under-Lavatory Pipe Supply Covers:
   1. Plumberex Specialty Products, Inc: www.plumberex.com/#sle.
   2. Substitutions: Section 01 60 00 - Product Requirements.

C. Electric Hand/Hair Dryers:
   1. Bobrick: www.bobrick.com.
   2. Excel Dryer: www.exceldryer.com/#sle.
   3. Substitutions: Section 01 60 00 - Product Requirements.

D. Diaper Changing Stations:
   1. Koala Kare Products: www.koalabear.com/#sle.
   2. Substitutions: 01 60 00 - Product Requirements.

2.02 MATERIALS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.

B. Mirror Glass: Annealed float glass, ASTM C1036 Type I, Class 1, Quality Q2, with silvering, protective and physical characteristics complying with ASTM C1503.

2.03 FINISHES

A. Stainless Steel: Satin finish, unless otherwise noted.

2.04 COMMERCIAL TOILET ACCESSORIES - SEE TOILET ACCESSORY SCHEDULE ON A-001

A. Toilet Paper Dispenser: Single roll, surface mounted bracket type, stainless steel, spindleless type for tension spring delivery designed to prevent theft of tissue roll.

B. Paper Towel Dispenser: Electric, roll paper type.
   1. Cover: Stainless steel.
   2. Paper Discharge: Touchless automatic.
   3. Capacity: 6 inch diameter roll.
   4. Mounting: Semi recessed.
   5. Power: Battery operated.
   6. Refill Indicator: Illuminated refill indicator.

C. Waste Receptacle: Stainless steel, freestanding style with swing top.

D. Combination Towel Dispenser/Waste Receptacle: Recessed flush with wall, stainless steel; seamless wall flanges, continuous piano hinges.

E. Automated Soap Dispenser: Foam soap dispenser, deck-mounted on vanity, with container concealed below deck; chrome-plated brass with bright polished finish; chrome-plated deck escutcheon.

F. Mirrors: Reversible LED Backlit Mirror, 0.19 inch thick safety glass; ASTM C1048 with 0.14mm PVC film backer with frosted sandblasting.
   1. Frame: 1mm thick anodized AL6061 frame.
   2. Power: 24V output and 110-277V input along with 0-10V dimming option.
   3. Aluminum mounting panel shall contain key hole slots both top and bottom to provide easy installation and prevent the mirror from pulling away from the wall.

G. Mirrors: Stainless steel framed, 1/4 inch thick annealed float glass; ASTM C1036.
   1. Frame: stainless steel angle frame, with heliarc welded, ground and polish smooth corners; satin finish.
   2. Backing: Full-mirror sized, minimum 0.03 inch galvanized steel sheet and nonabsorptive filler material, with horizontal hanging brackets near the top and bottom of the mirror.
   3. Seat Cover Dispenser: Stainless steel, surface-mounted, reloading by concealed opening at base, tumbler lock.
   4. Grab Bars: Stainless steel, smooth surface.
   5. Sanitary Napkin Disposal Unit: Stainless steel, surface-mounted, self-closing door, locking bottom panel with full-length stainless steel piano-type hinge, removable receptacle.

2.05 ELECTRIC HAND/HAIR DRYERS

A. Electric Hand Dryers: Traditional fan-in-case type, with downward fixed nozzle.
   1. Operation: Automatic, sensor-operated on and off.
   2. Mounting: Surface mounted.
   3. Cover: Plastic.
      a. Tamper-resistant screw attachment of cover to mounting plate.

2.06 UTILITY ROOM ACCESSORIES

A. Mop and Broom Holder: 0.05 inch thick stainless steel, Type 304, hat-shaped channel.
   1. Holders: Three spring-loaded rubber cam holders.
   2. Length: 36 inches.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

C. For electrically-operated accessories, verify that electrical power connections are ready and in the correct locations.

D. See standard partition wall details for installation of blocking, reinforcing plates, and concealed anchors in walls and ceilings.

3.02 PREPARATION

A. Deliver inserts and rough-in frames to site for timely installation.

B. Provide templates and rough-in measurements as required.

3.03 INSTALLATION

A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.

B. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.

3.04 PROTECTION

A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION 10 28 00

This page intentionally left blank

SECTION 10 43 00
EMERGENCY AID SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Automated external defibrillators (AEDs).

B. Automated external defibrillator (AED) cabinets.

C. First aid cabinets.

D. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Wood blocking product and execution requirements.

B. Section 09 91 23 - Interior Painting: Field paint finish.

1.03 DEFINITIONS

A. Automated External Defibrillator (AED): A Food and Drug Administration (FDA)-approved portable device, which automatically analyzes the heart rhythm and recognizes the presence of ventricular fibrillation and/or tachycardia. If defibrillation is warranted, the AED automatically charges and prompts (visual and/or audio) the operator to deliver an electrical shock.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide AED operational features, color and finish, anchorage details, and installation instructions.

C. Shop Drawings: Indicate locations of cabinets and cabinet physical dimensions.

D. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Maintenance Data: Include test schedules and recertification requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Automated External Defibrillators (AEDs), include with Emergency Cabinets E05 & E06:
   1. Activar; Lifepak CR2 Defibrillator - LP-CR2-USB-AUTO: www.actuvacpg.com.
   2. Philips Medical Systems: www.usa.philips.com/#sle.
   3. ZOLL Medical Corporation: www.zoll.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Emergency Aid Cabinets and Accessories:
   1. Activar Construction Products Group, Inc. - JL Industries; LifeStart 1400 Series AED Cabinet: www.activarcpg.com/#sle.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 AUTOMATED EXTERNAL DEFIBRILLATORS (AEDS)

A. Automated External Defibrillators (AEDs) - General: FDA approval required.

2.03 EMERGENCY AID CABINETS

A. Type: Automated external defibrillator (AED).

B. Cabinet Construction: Non-fire-rated.
   1. Formed primed steel sheet; 0.036 inch thick base metal.

C. Cabinet Configuration: Fully-Recessed type. (E05 - See Equpiment Schedule on Sheet A-001):
   1. Tube I.D.: 14" x 14" x 6 3/4".

2. Frame O.D.: 17 3/8" 17 3/8".
3. Wall Opening: 15" x 15" x 5 3/8".

D. Cabinet Configuration: Semi-Recessed (E06 - See Equpiment Schedule on Sheet A-001):
1. Tube I.D.: 14" x 14" x 6 3/4".
2. Frame O.D.: 17 3/8" 17 3/8".
3. Wall Opening: 15" x 15" x 3 7/8".

E. Size to accommodate AED.

F. Door: 0.036 inch metal thickness, reinforced for flatness and rigidity with wire pull handle and nylon catch. Hinge door for 180 degree opening with two butt hinges.

G. Door Glazing: Tempered glass, clear, 1/8 inch thick, and set in resilient channel glazing gasket.

H. Cabinet Mounting Hardware: Appropriate to cabinet, with predrilled holes for placement of anchors.

I. Finish of Door Pull or Handle: Powder coat, white color.

J. Finish of Cabinet Interior: White powder coat.

2.04 ACCESSORIES

A. Cabinet Door Signage: 'AED” decal, or vinyl self-adhering, prespaced black lettering and identifying graphic in accordance with authorities having jurisdiction (AHJ).

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Secure rigidly in place.

C. Place AEDs in cabinets.

D. Wall Signs:
1. Location: Where shown on floor plans.
2. Apply on walls after field painting is completed and has been accepted.

E. Cabinet Lettering:
1. Location: Face of door framing.
2. Apply lettering on factory-finished cabinets either at the factory or just prior to Substantial Completion.

3.03 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.

B. Adjust cabinet doors to operate smoothly without binding. Verify that alarms and integral locking devices operate properly.

C. On completion of cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes. Replace cabinets that cannot be restored to factory-finished appearance. Use materials and procedures recommended by cabinet manufacturer.

3.04 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals for closeout submittals.

B. See Section 01 79 00 - Demonstration and Training for additional requirements.

C. Demonstrate proper operation of AED to City's designated representative.

END OF SECTION 10 43 00

This page intentionally left blank

SECTION 10 44 00
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire extinguishers.
   1. Including Fire Extinguisher Cabinets.

B. Fire Department Key Boxes and Switches.
   1. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Wood blocking product and execution requirements.

B. Section 09 91 23 - Interior Painting: Field paint finish.

1.03 REFERENCE STANDARDS

A. FM (AG) - FM Approval Guide current edition.

B. NFPA 10 - Standard for Portable Fire Extinguishers 2017, with Errata (2018).

C. UL (DIR) - Online Certifications Directory Current Edition.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

1.05 FIELD CONDITIONS

A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Multipurpose Chemical Fire Extinguishers:
   1. JL Industries Cosumic 5E 3A-40BC: www.jlindustries.com.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Fire Extinguisher Cabinets and Accessories:
   1. Activar Construction Products Group, Inc. - JL Industries; Ambassador Series: www.activarcpg.com/#sle.
   2. Nystrom, Inc: www.nystrom.com/#sle.
   3. Potter-Roemer: www.potterroemer.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 FIRE EXTINGUISHERS

A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
   1. Provide extinguishers labeled by UL (DIR) or FM (AG) for purpose specified and as indicated.

B. Chemical Type Fire Extinguisher (E03 - See Equipment Schedule on Sheet A-001):
   1. Basis of Design: JL Industries Model Cosmic 5E
   2. Nominal Capacity: 5 lbs.
   3. Cylinder Diameter: 4-1/4"
   4. Overall Height: 16-3/8"
   5. Overall Width: 7-1/4"
   6. U/L Rating: 3A-40BC.
   7. Include with EO1 and E02 Cabinet below.

2.03 FIRE EXTINGUISHER CABINETS

A. Fire Rated Cabinet Construction: One-hour fire rated. At any wall indicated as 1-hour fire rated wall, see plans.

B. Chemical Type Fire Extinguisher Cabinet, Fully-Recessed (E01 - See Equipment Schedule on Sheet A-001):
   1. Basis of Design: JL Industries Ambassador Model 1815.
   2. Flat Trim: 3/8" flat trim, Fully-Recessed.
   3. Tub I.D.:
      a. Dimensions - 10 1/2" x 24" x 5 1/2".
      b. Material - Cold Rolled Steel.
      c. Finish: White Powder Coat.
   4. Frame O.D.:
      a. Dimensions - 13 7/8"" x 27 3/8".
      b. Material - Cold-rolled steel.
      c. Finish - White Powder Coat.
   5. Wall Opening: 12 13/16" x 26 5/16" 6 7/16".
   6. Door Style - First floor public areas including Council Chambers, both buildings:
      a. Style G: Full glazing with Saft-T-Lok, theft deterrent, pull handle.
   7. Door Style - all other areas, both buildings:
      a. Style F: Full glazing with pull handle.
   8. Door Glazing: Clear tempered glass.
   9. Cabinet Lettering:
      a. Mounting Direction: Horizontal.
      b. Text: “FIRE EXTINGUISHER” decal, or vinyl self-adhering, pre-spaced black lettering in accordance with authorities having jurisdiction (AHJ).
   10. Include with fire extinguisher, listed above.

C. Chemical Type Fire Extinguisher Cabinet, Semi-Recessed (E02 - See Equipment Schedule on Sheet A-001):
   1. Basis of Design: JL Industries Ambassador Model 1817.
   2. Trim Style: 3" Rolled Edge, Semi-Recessed.
   3. Tub I.D.:
      a. Dimensions - 10 1/2" x 24" x 5 1/2".
      b. Material - Cold Rolled Steel.
      c. Finish: White Powder Coat.
   4. Frame O.D.:
      a. Dimensions - 13 7/8"" x 27 3/8".
      b. Material - Cold-rolled steel.
      c. Finish - White Powder Coat.
   5. Wall Opening: 12 13/16" x 26 5/16" 3 5/8"".
   6. Door Style - First floor public areas including Council Chambers, both buildings:
      a. Style G: Full glazing with Saft-T-Lok, theft deterrent, pull handle.
   7. Door Style - all other areas, both buildings:
      a. Style F: Full glazing with pull handle.
   8. Door Glazing: Clear tempered glass.
   9. Cabinet Lettering:
      a. Mounting Direction: Horizontal.
      b. Text: “FIRE EXTINGUISHER” decal, or vinyl self-adhering, pre-spaced black lettering in accordance with authorities having jurisdiction (AHJ).
   10. Include with fire extinguisher, listed above.

2.04 ACCESSORIES

A. Extinguisher Brackets: Formed steel, chrome-plated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install cabinets plumb and level in wall openings, 59 inches from finished floor to top of extinguisher.

C. Secure rigidly in place.

D. Place extinguishers in cabinets.

3.03 MAINTENANCE

A. See Section 01 70 00 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

B. Provide a separate maintenance contract for specified maintenance service.

END OF SECTION 10 44 00

This page intentionally left blank

SECTION 10 55 91.01
IN-WALL PAYMENT DROP BOX

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal receiving box.

1.02 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for component items, physical sizes, clearances required .

C. Shop Drawings: Indicate locations, vertical construction and anchorage details, dimensions, rough openings required, size and tolerances of floor openings.

D. Manufacturer's Instructions: Include installation procedures, coordination requirements, and maintenance instructions.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.03 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Mail Chutes:
   1. Basis of Design: Interbank In-Wall Payment Drop Box - Model 500-IW.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 CHUTE COMPONENTS

A. Chute Side Trim, Face Plate, and Base Plate:
   1. Stainless steel, No. 4 finish, 0.047 inch thick.

B. Chute Back and Side Panels: Galvanized sheet steel, 0.036 inch thick, finished in flat black enamel on internal exposed-to-view surfaces.

2.03 RECEIVING BOX COMPONENTS

A. Receiving Box Face Frame and Door: See Manufacturer's Cut Sheet

B. Cabinet: 11 5/8" w x 11 5/8" d x 15 5/8" h.

C. Rough Opening: 12.5” w x 16.5” h.

D. Receiving Box Construction:
   1. Cabinet is 12 x 12 x 16 inches tall

E. Walls constructed of heavy gauge fold-weld stainless steel.

F. .125 inch thick stainless steel top and bottom mounting plates w/ 1/2" diameter pre drilled holes for vertical anchoring.

G. All brass-works high security lock with (2) double-bitted keys and strong cams.

H. Rainshield fastenener beneath ID plate to protect 6.25 x .25 inch high payment slot.

I. Sign: PLACE PAYMENTS HERE".

J. Aluminum flange 2" x 2" angle cut, fitted and fastened to body.

K. Weather sealed for exterior installation.

L. ID plate with "City of Stockton".

2.04 ACCESSORIES

A. Wall Anchors: 1/8 by 1-1/2 inch prime painted steel, elongated anchor bolt holes for adjustment.

B. Fasteners: Exposed countersunk oval head screws with head color to match finish metal; corrosion resistant.

C. Double lock door panel.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

A. Verify that field measurements are as indicated.

B. Verify that surfaces are ready to receive work.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install mail chute plumb, through floor openings.

C. Install chute progressively, ensuring flush section joints.

D. Locate lockable access panels at each floor to ensure access to chute for servicing.

E. Conceal fastenings where exposed to view.

F. Fit trim, ceiling and floor cover pieces accurately and tightly to adjacent construction.

3.03 TOLERANCES

A. Maximum Variation From Plumb: 1/8 inch.

B. Maximum Offset From True Dimensional Alignment: 1/4 inch.

3.04 CLEANING

A. Clean chute interior and finish trim surfaces.

B. Remove strippable temporary protection after adjacent work is complete.

C. Clean exposed metal and glass surfaces with mild cleaning agents.

END OF SECTION 10 55 91.01

SECTION 10 56 26
MOBILE STORAGE SHELVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Mechanically assisted mobile storage shelving systems.

1.02 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturer's data sheets on each product to be used, including:
   1. Accessories.

C. Shop Drawings: Indicate location, type, and layout of mobile storage shelving system, including lengths, heights, and aisle layout, and relationship to adjacent construction.
   1. Manufacturer to review electric lighting layout at proposed installation location and provide coordination comments prior to installation of lighting and shelving.
   2. Indicate location and configuration of rails.
   3. Provide location and details of anchorage devices to be embedded in or fastened to the structure.
   4. Motorized Systems: Include plan views indicating locations of system components and proposed size, type, and routing of conduits and/or cables. Include system interconnection schematic diagrams.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Inspect for dents, scratches, or other damage. Replace damaged components.

B. Store in manufacturer's unopened packaging until ready for installation.

C. Store under cover and elevated above grade.

PART 2 PRODUCTS

2.01 MOBILE STORAGE SHELVING SYSTEMS - GENERAL

A. System Description: High-density movable shelving system consisting of shelving units mounted on rail-guided wheeled carriages.
   1. Carriage Operation: Mechanically assisted.
   2. Carriage Capacity: Equivalent to basis of design.
   3. Rail Mounting: Recessed in concrete slab with finished floor flush with top of rails.

B. Components:
   1. Carriages: Rectangular steel frames of type and size required for selected system.
   2. Wheels: Cold rolled steel; dual flanged.
   3. Rails: Cold rolled steel; type and size to carry loads imposed by system.
   4. Grout: Non-shrink hydraulic type cement.

2.02 MECHANICALLY ASSISTED MOBILE STORAGE SHELVING SYSTEMS

A. Drive System: Provide uniform movement of the carriage without drifting or jerking.
   1. Chain and sprocket system with full length torque resistant steel shaft.
   2. Provide two wheels per rail for each carriage, direct-driven on one side.

B. Control: Three-spoke operating handle with manual locking latch.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that substrate is in proper condition to install rails and flooring system per manufacturer's requirements.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 INSTALLATION

A. General: Install system components and accessories in accordance with manufacturer's printed instructions.

B. Position system components level and plumb within manufacturer's specified tolerances.

C. For recessed rail installation, grout rails the full length of the system.

D. Maintain a minimum of 1/4 inch of grout between the high points of concrete subfloor and bottom of rails.

E. Extend rails under stationary shelving units.

F. Position carriages ensuring wheels align properly on rails. Fasten multiple carriages together forming a single movable base.

G. Install shelving with shelf surfaces level and vertical supports plumb; fasten to carriage supports with vibration-proof fasteners.

3.03 ADJUSTING

A. Adjust mobile storage shelving components and accessories to provide for smooth operation of system.

3.04 CLEANING

A. Clean shelving and surrounding area after installation.

3.05 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

3.06 PROTECTION

A. Protect installed system from subsequent construction operations.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION 10 56 26

SECTION 12 21 13
HORIZONTAL LOUVER BLINDS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Horizontal slat louver blinds.

B. Operating hardware.

1.02 REFERENCE STANDARDS

A. WCMA A100.1 - Safety of Window Covering Products 2018.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the placement of concealed blocking to support blinds. See Section 06 10 00.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data indicating physical and dimensional characteristics.
   1. Motorized Blinds: Include power requirements and standard wiring diagrams.

C. Shop Drawings: Indicate opening sizes, tolerances required, method of attachment, clearances, and operation.

D. Samples: Submit two samples, 2 inch long illustrating slat materials and finish, cord type and color.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Horizontal Louver Blinds Without Side Guides:
   1. Hunter Douglas Architectural; H2 Model: www.hunterdouglasarchitectural.com/#sle.
   2. Levolor: www.levolor.com/commercial/#sle.
   3. SWFcontract, a division of Springs Window Fashions, LLC: www.swfcontract.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Source Limitations: Furnish blinds and associated controls produced by a single manufacturer and obtained from a single supplier.

2.02 BLINDS WITHOUT SIDE GUIDES

A. Description: Horizontal slat louvers hung from full-width headrail with full-width bottom rail.

B. Manual Operation: Control of raising and lowering by cord with full range locking; blade angle adjustable by control wand.

C. Metal Slats: Spring tempered pre-finished aluminum; square slat corners, with manufacturing burrs removed.
   1. Width: 1/2 inch.
   2. Thickness: 0.008 inch.
   3. Color: As selected by Architect.

D. Slat Support: Woven polypropylene cord, ladder configuration.

E. Head Rail: Pre-finished, formed aluminum box, with end caps; internally fitted with hardware, pulleys, and bearings for operation; same depth as width of slats.

F. Lift Cord: Braided nylon; continuous loop; complying with WCMA A100.1.
   1. Free end weighted.
   2. Color: As selected by Architect.

G. Control Wand: Extruded hollow plastic; hexagonal shape.
   1. Non-removable type.
   2. Length of window opening height less 3 inch.
   3. Color: Clear.

H. Headrail Attachment: Wall brackets.

2.03 FABRICATION

A. Determine sizes by field measurement.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that openings are ready to receive the work.

3.02 INSTALLATION

A. Install blinds in accordance with manufacturer's instructions.

B. Secure in place with flush countersunk fasteners.

3.03 TOLERANCES

A. Maximum Variation of Gap at Window Opening Perimeter: 1/4 inch.

B. Maximum Offset From Level: 1/8 inch.

3.04 ADJUSTING

A. Adjust blinds for smooth operation.

3.05 CLEANING

A. Clean blind surfaces just prior to occupancy.

3.06 SCHEDULE

A. All interior office and conference room glazing including windows, door and door sidelights.

B. All exterior windows, all floors excluding existing windows around Council Chambers that will have black out film applied.

END OF SECTION 12 21 13

SECTION 12 24 00
MOTORIZED WINDOW SHADES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Motorized roller shades and accessories.

B. Motor controls, interfaces, and accessories.

C. Window shade schedule per shop drawing requirements below.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Concealed wood blocking for attachment of shade brackets and accessories.

B. Section 09 51 00 - Acoustic Ceilings.

C. Section 09 21 16 - Gypsum Board Assemblies: framed gypsum board soffits.

D. Section 09 22 16 - Non-Structural Metal Framing: Framed gypsum board soffits.

E. Section 26 01 00 - General Requirements of Electrical Work: for control interface with motorized shades.

1.03 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

B. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films 2019.

C. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems Current Edition, Including All Revisions.

D. WCMA A100.1 - Safety of Window Covering Products 2018.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Contractor shall be responsible for final interface of motorized shade control with building management system control.
   2. Provide electrical wiring as required for installation of hardwired motorized shades.

B. Sequencing:
   1. Do not fabricate shades until field dimensions for each opening have been taken with finished conditions in place. "Hold to" dimensions are not acceptable.
   2. Do not install shades until final surface finishes and painting are complete.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product to be used including materials, finishes, fabrication details, dimensions, profiles, mounting requirements, and accessories.
   1. Motorized Shades: Include power requirements and standard wiring diagrams solely for the specified products.

C. Shop Drawings: Include shade schedule indicating size, location and keys to details.
   1. Motorized Shades: Include one-line diagrams, wire counts, coverage patterns, and physical dimensions of each item. Include location plan showing all switch and control zones, switches, sensors and other control accessories.

D. Verification Samples: Minimum size 6 inches square, representing actual materials, color and pattern.

E. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation of product.

F. Operation and Maintenance Data: List of all components with part numbers, and operation and maintenance instructions; include copy of shop drawings.

G. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in City's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Motorized Shades: Comply with NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than ten years of documented experience.

C. Installer Qualifications: Company specializing in performing work of this type with minimum ten years of documented experience with shading systems of similar size, type, and complexity; manufacturer's authorized representative.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades in manufacturer's unopened packaging, labeled to identify each shade for each opening.

B. Handle and store shades in accordance with manufacturer's recommendations.

1.08 FIELD CONDITIONS

A. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.09 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide manufacturer's standard, non-depreciating warranty, for interior shading only, covering the following:
   1. Shade Hardware: 10 years unless otherwise indicated.
   2. Shade Fabric: 25 years unless otherwise indicated.
   3. Electric Motors, Controls, and Accessories: Five years.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: MechoShade Systems LLC; www.mechoshade.com.
   1. Local Representative Brian Yates – brian.yates@mechoshade.com 530-488-0013

B. Substitutions: See Section 01 60 00 - Product Requirements.
   1. Proposed substitutions must be submitted in writing for approval by Architect a minimum of 10 working days prior to the bid date and must be made available to all bidders. Proposed substitutions must be accompanied by certification of compliance with specifications listing all exceptions.
   2. Products other than basis of design are subject to compliance with specified requirements and prior approval of Architect. By using products other than basis of design, Contractor accepts responsibility for costs associated with any necessary modifications to related work, including any design fees.

2.02 ROLLER SHADES

A. General:
   1. Provide shade system components that are capable of being removed or adjusted without removing mounted shade brackets or cassette support channel.
   2. Provide shade system that operates smoothly when shades are raised or lowered.
   3. Electrical Components: Listed, classified, and labeled as suitable for the purpose intended. Individual testing of components will not be acceptable in lieu of system testing. Where applicable, system components to be FCC compliant.

B. Electrically operated Roller Shades Type 1 - Basis of Design: MechoShade Systems LLC; ElectroShade with WhisperShade IQ2 EDU, line voltage (120 VAC);

www.mechoshade.com/#sle.

1. Description: Single roller, motor operated fabric window shade system complete with mounting brackets, roller tubes, hembars, hardware, and accessories.
   a. Mounting: as indicated on drawings..
   b. Size: As indicated on drawings. Custom sizes and custom parts required, see drawings.
   c. Fabric: SoHo Elevate series 1680. Color as selected by Architect from standard range of colors.
2. Brackets and Mounting Hardware: As recommended by manufacturer for mounting indicated and to accommodate shade fabric roll-up size and weight.
   a. Material: Steel, 1/8 inch thick.
3. Roller Tubes:
   a. Material: Extruded aluminum.
   b. Size: As recommended by manufacturer; selected for suitability for installation conditions, span, and weight of shades.
   c. Fabric Attachment: Utilize extruded channel in tube to accept vinyl spline welded to fabric edge. Shade band to be removable and replaceable without removing roller tube from brackets or inserting spline from the side of the roller tube.
4. Hembars: Designed to maintain bottom of shade straight and flat.
5. Accessories:
   a. Ceiling Pockets with Prewired Raceway: UL 325 listed, extruded aluminum shade pocket with removable closure panel, for recess mounting in acoustical tile or drywall ceilings; size and configuration as indicated on drawings.
      1) Designed to accommodate installation of motor control and wiring accessories within pocket including, but not limited to, line voltage disconnect modular connector, MechoNet Wireless Controller, IQ2 Dual Splitter, and non-plenum rated daisy chain wiring.
      2) Product: MechoShade Systems LLC; ElectroPocket;

2.03 SHADE FABRIC

A. Fabric for Light Filtering Shades: Non-flammable, color-fast, impervious to heat and moisture, and able to retain its shape under normal operation.
   1. Cleanability and Disinfecting: ShadeCloth must meet cleanability and disinfecting requirements via 3rd party testing to comply with BIFMA HCF 8.1-2014 standards using chemical solutions compliant with EPA guidelines for use against COVID-19
   2. Performance Requirements:
      a. Flammability: Pass NFPA 701 large or small scale test.
      b. Visible Light Transmittance (Tv): 11%, nominal.
      c. Acoustical performance – minimum 0.25 NRC/0.29 SAA
   3. Openness Factor: 3%, nominal.
   4. Color: As selected by Architect from manufacturer’s full range of colors.
   5. Basis of Design Product:
      a. MechoShade Systems LLC Inc; Soho Elevate - 1680 Series (3% open): www.mechoshade.com/#sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 INTELLIGENT ENCODED ELECTRONIC DRIVE SYSTEM

A. Electronic Drive Unit (EDU) System - General Requirements:
   1. System to be certified and labelled as a UL 325 listed solution. Recognized component certification is not acceptable in lieu of system testing. Listing label and motor rating to be readily visible for inspection without requiring dismounting of shade assembly for motor or EDU to be removed from shade roller tube.
   2. EDU size and configuration to be as recommended by manufacturer for the type, size, and arrangement of shades to be operated.
   3. Conceal EDU inside shade roller tube.

4. Use EDU's rated at the same nominal speed for shades in the same room.
5. Total hanging weight of shade band not to exceed 80 percent of rated lifting capacity of shade EDU and tube assembly.
6. Provide EDU with capability of upgrading firmware from anywhere on network without touching the motor.

B. Line Voltage EDU (120 VAC):
1. Basis of Design: MechoShade Systems LLC; WhisperShadeIQ2 System; www.mechoshade.com/#sle.
2. Description: Tubular, asynchronous (non-synchronous), with integral AC motor and reversible capacitor operating at 120 VAC, single phase, 60 Hz; temperature Class B, thermally-protected, totally enclosed, maintenance-free; powered by line voltage power supply connection equipped with locking disconnect plug assembly furnished with EDU.
3. Audible Noise: 46 dBA or less measured 3 feet from the motor unit, depending on motor torque.
4. Nominal Speed: Minimum of 34 RPM; does not vary due to load/lift capacity.
5. EDU to provide isolated, low voltage power supply for powering external accessories connected to either the dry contact port or the network port. Products that require accessories to be powered by a plug-in or externally-supplied power supply are not acceptable.

C. Modes of Operation:
1. Uniform Mode: Allows for shades to move only to defined intermediate stop positions in order to maintain aesthetic uniformity.
2. Normal Mode: Allows for shades to move to defined intermediate stop positions plus any position between defined upper and lower limits.
3. Maintenance Mode: Prevents shade from moving to newly commanded positions via dry contact or network control commands until EDU has been serviced and/or Maintenance Mode has been cleared/disabled.

D. Control Methods: Support both local isolated dry contact input and network control.
1. Local Isolated Dry Contact Inputs:
a. Supports local switch control and third party system integration without separate interface.
b. Supports moving EDU/shade to upper and lower limits and to local switch preset positions.
c. Allows for configuration of upper and lower limits, custom presets, and key modes of operation without requiring a PC or similar microprocessor-based tools.
d. Supports configuration under protected sequences to prevent changes by casual user.

E. Alignment Positions:
1. Each EDU to support positioning commands from 0 to 100 percent in 1 percent increments and 32 customizable presets, including three intermediate dry contact presets resulting in repeatable and precisely aligned shade positions and limits.
2. Shades on the same switch circuit or with the same network group address with the same opening height to align at each limit or preset (intermediate stopping position) when traveling from any position, up or down.
3. Shades of differing heights to be capable of custom, aligned intermediate stop positions when traveling from any position, up or down.
4. Alignment of standard shade bands mechanically aligned on the same EDU not to exceed plus/minus 0.125 inch when commanded to the same alignment position.
5. Alignment of standard shades on adjacent EDU's not to exceed plus/minus 0.25 inch when commanded to the same alignment position.

F. Local Switch Presets:
1. Provide a minimum of three customizable preset positions accessible over the local dry contact control inputs and over the network connection.

2. Preset positions to be customizable to any position between and including the defined upper and lower limits (initially defaults to 25, 50, and 75 percent of shade travel).
3. Support configuration of custom preset positions using either a handheld removable program module/configurator or a local switch.

2.05 MOTOR CONTROLS

A. Unless specifically indicated to be excluded, provide all required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, software, system programming, etc. as necessary for a complete operating system that provides the control intent indicated.

B. Provide all components and connections necessary to interface with other systems as indicated.

2.06 LOW-VOLTAGE WALL CONTROLS; IQ SWITCH:

A. Momentary dry contact switch enables manual local control or network control of any individual shade motor or shade group/sub-group on MechoNet network.

B. Control Functions:
1. Open: Automatically open controlled shades to fully open position when button is pressed.
2. Close: Automatically close controlled shades to fully closed position when button is pressed.
3. Presets: For selection of predetermined shade positions.
4. Dual Stations: For individual control of two shades/groups.

C. Finish: White.

D. Single Station: 5-button (open, close, and three intermediate stop positions).

E. Double Station: 10-button (open, close, and three intermediate stop positions for each of two shades/groups).

2.07 ROLLER SHADE FABRICATION

A. Field measure finished openings prior to ordering or fabrication.

B. Dimensional Tolerances: Fabricate shades to fit openings within specified tolerances.
1. Vertical Dimensions: Fill openings from head to sill with 1/2 inch space between bottom bar and window stool.
2. Horizontal Dimensions - Inside Mounting: Provide symmetrical light gaps on both sides of shade not to exceed 3/4 inch total.
3. Horizontal Dimensions - Outside Mounting: Cover window frames, trim, and casings completely.

C. At openings requiring continuous multiple shade units with separate rollers, locate roller joints at window mullion centers; butt rollers end-to-end.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine finished openings for deficiencies that may preclude satisfactory installation.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Start of installation shall be considered acceptance of substrates.

3.02 PREPARATION

A. Prepare surfaces using methods recommended by manufacturer for achieving best result for substrate under the project conditions.

B. Coordinate with window installation and placement of concealed blocking to support shades.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions and approved shop drawings, using mounting devices as indicated.

B. Adjust level, projection, and shade centering from mounting bracket. Verify there is no telescoping of shade fabric. Ensure smooth shade operation.

3.04 SYSTEM STARTUP

A. Motorized Shade System: Provide services of a manufacturer's authorized representative to perform system startup.

3.05 CLEANING

A. Clean soiled shades and exposed components as recommended by manufacturer.

B. Replace shades that cannot be cleaned to "like new" condition.

3.06 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

B. Demonstration: Demonstrate operation and maintenance of window shade system to City's personnel.

3.07 PROTECTION

A. Protect installed products from subsequent construction operations.

B. Touch-up, repair or replace damaged products before Substantial Completion.

3.08 MAINTENANCE

A. See Section 01 70 00 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

END OF SECTION 12 24 00

SECTION 12 36 00
COUNTERTOPS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Countertops for architectural cabinet work.

B. Quartz countertops.

C. Setting materials and accessories.

1.02 RELATED REQUIREMENTS

A. Section 06 41 00 - Architectural Wood Casework.

B. Section 22 40 00 - Plumbing Fixtures: Sinks.

1.03 REFERENCE STANDARDS

A. CAL OSHA guidelines for Engineered Stone Countertop Fabrication: https://www.dir.ca.gov/dosh/dosh_publications/Engineered-stone-counters.pdf (2019).

B. AWI (QCP) - Quality Certification Program Current Edition.

C. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition 2014, with Errata (2016).

D. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 4.0 2021.

E. ISFA 2-01 - Classification and Standards for Solid Surfacing Material 2013.

F. NEMA LD 3 - High-Pressure Decorative Laminates 2005.

G. PS 1 - Structural Plywood 2009 (Revised 2019).

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Specimen warranty.

C. Shop Drawings: Complete details of materials and installation; combine with shop drawings of cabinets and casework specified in other sections.Include countertop layout, dimensions, materials, finishes, cutouts, and attachments.
   1. Coordinate required counter height and thickness with under-counter equipment installation requirements. Notify Architect prior to installation of any installibility conflicts.

D. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and patterns.

E. Verification Samples: For each finish product specified, minimum size 3 inches square, representing actual product, color, and patterns.

F. Test Reports: Chemical resistance testing, showing compliance with specified requirements.

G. Certificate: Submit labels and certificates required by quality assurance and quality control programs.

1.05 QUALITY ASSURANCE

A. Provide manufacturer’s 10 year warranty against defects in materials and workmanship.

B. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.

C. Quality Certification:

1. Comply with AWI (QCP) woodwork association quality certification service/program in accordance with requirements for work specified in this section: www.awiqcp.org/#sle.
2. Provide labels or certificates indicating that the installed work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.
3. Provide designated labels on shop drawings as required by certification program.
4. Provide designated labels on installed products as required by certification program.
5. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.07 FIELD CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.01 COUNTERTOPS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Plastic Laminate Countertops: High-pressure decorative laminate (HPDL) sheet bonded to substrate.
   1. Laminate Sheet: NEMA LD 3, Grade HGS, 0.048 inch nominal thickness.
      a. Manufacturers:
         1) Formica Corporation: www.formica.com/#sle.
         2) Panolam Industries International, Inc; Nevamar Hi-Wear: www.panolam.com/#sle.
         3) Wilsonart: www.wilsonart.com/#sle.
         4) Substitutions: See Section 01 60 00 - Product Requirements.
      b. Wear Resistance: In addition to specified grade, comply with NEMA LD 3 High Wear Grade requirements for wear resistance.
      c. Laminate Core Color: Same as decorative surface.
      d. Finish: Matte or suede, gloss rating of 5 to 20.
      e. Surface Color and Pattern: As indicated on drawings.
      f. Substrate: 3/4" plywood.
   2. Exposed Edge Treatment: Postformed laminate; front edge substrate built up to minimum 1-1/4 inch thick with raised radiused edge, integral coved backsplash with radiused top edge.
   3. Back and End Splashes: Same material, same construction.
   4. Fabricate in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 11 - Countertops, Premium Grade.

C. Quartz Solid Surfacing Countertops: Solid surfacing sheet or plastic resin casting over continuous substrate.
   1. Slab thickness: 1-1/4 inch, minimum.
   2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
      a. Manufacturers:
         1) Daltile; One Quartz: www.daltile.com.

2) Substitutions: See Section 01 60 00 - Product Requirements.

b. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.

3. Other Components Thickness: 3/4 inch, minimum.
4. Back and End Splashes: Same sheet material, square top; minimum 4 inches high.
5. Skirts: As indicated on drawings.
6. Fabricate in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 11 - Countertops, Premium Grade.

2.02 MATERIALS

A. Quartz Slab:
   1. Composition: Quartz aggregate, resin, and color pigments formed into flat slabs.
   2. Anti-microbial protection: Microban by Microban International, Inc., integral to sheet.
   3. Color: as indicated on drawings.
   4. Thickness: 1-1/4 inches.
   5. Physical characteristics:
      a. Static coefficient of friction: 1.02 dry, 0.51 wet, tested to ASTM C1028.
      b. Water absorption: Maximum 0.03 percent, tested to ASTM C97.
      c. Compressive strength: Minimum 29,000 psi, tested to ASTM C170.
      d. Bond strength: Minimum 210 psi, tested to ASTM C482.
      e. Modulus of rupture: Minimum 6300 psi, tested to ASTM C99.
      f. Flexural strength: Minimum 5800 psi, tested to ASTM C880.
      g. Breaking strength: Minimum 480 lbf, tested to ASTM C648.
      h. Stain resistance: Not affected by 10 percent hydrochloric acid or 10 percent KOH, tested to ASTM C650.
      i. Thermal shock resistance: Pass 5 cycles, tested to ASTM C484.
      j. Abrasive index: 65-Ha = 25, tested to ASTM C241.
      k. Thermal expansion: 1.670 x 10-5 in/in/deg F, tested to ASTM C531.
      l. Deicing resistance: Rating of 0, tested to ASTM C672/C672M.
      m. Freeze/thaw resistance: 0 tiles at 15 cycles, tested to ASTM C1026.
      n. Flame spread rating: Class 1, tested to ASTM E84.

B. Extruded Aluminum: ASTM B211/B211M, 6463 alloy, T5 temper.

C. Wood-Based Components:
   1. Wood fabricated from old growth timber is not permitted.
   2. Provide sustainably harvested wood, certified or labeled as specified in Section 01 60 00 - Product Requirements.
   3. Provide wood harvested within a 500 mile radius of the project site.
   4. Wood fabricated from timber recovered from riverbeds or otherwise abandoned is permitted, unless otherwise noted, provided it is clean and free of contamination; identify source; provide lumber re-graded by an inspection service accredited by the American Lumber Standard Committee, Inc.

D. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 3/4 inch thick; join lengths using metal splines.

E. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.

F. Joint Sealant: Mildew-resistant silicone sealant, white.

2.03 FABRICATION

A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
   1. Join lengths of tops using best method recommended by manufacturer.
   2. Fabricate to overhang fronts and ends of cabinets 1 inch except where top butts against cabinet or wall.
   3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.

B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
   1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
   2. Height: 4 inches, unless otherwise indicated.

C. Wall-Mounted Counters: Provide skirts, aprons, brackets, and braces as indicated on drawings, finished to match.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Follow CAL OSHA guidelines for Engineered Stone Countertop Fabrication: https://www.dir.ca.gov/dosh/dosh_publications/Engineered-stone-counters.pdf.

3.03 INSTALLATION

A. Install countertops in accordance with CAL OSHA, manufacturer’s instructions and approved Shop Drawings.

B. Adhere countertops to supports with continuous beads of adhesive.

C. Set plumb and level. Align adjacent pieces in same plane.

D. Install with hairline joints.

E. Fill joints between countertops and adjacent construction with joint sealer; finish smooth and flush.

F. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.

G. Attach plastic laminate countertops using screws with minimum penetration into substrate board of 5/8 inch.

H. Seal joint between back/end splashes and vertical surfaces.

3.04 TOLERANCES

A. Maximum variation from level and plumb: 1/8 inch in 10 feet, noncumulative.

B. Maximum variation in plane between adjacent pieces at joint: Plus or minus 1/16 inch.

C. Variation From Horizontal: 1/8 inch in 10 feet, maximum.

D. Offset From Wall, Countertops: 1/8 inch maximum; 1/16 inch minimum.

E. Field Joints: 1/8 inch wide, maximum.

3.05 CLEANING

A. Clean countertops in accordance with manufacturer’s instructions.

3.06 PROTECTION

A. Protect installed countertops with nonstaining sheet coverings.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION 12 36 00

This page intentionally left blank

SECTION 12 61 00
FIXED AUDIENCE SEATING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fixed, upholstered audience chairs at Council Chambers.

B. Removable, upholstered auditorium chairs.

C. Moveable ADA, upholstered auditorium chairs.

1.02 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's printed data sheets for products specified.

C. Shop Drawings: Fabrication and installation details, chair layouts and dimensions and seat numbering scheme.

D. Verification Samples: Full-size two-seat fabricated sample of each type of chair specified, including all accessories and one end panel, illustrating all finishes and workmanship to be expected in the finished Work; approved sample may be incorporated into the Work.

E. Maintenance Materials:
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Fabric: Quantity sufficient for reupholstering 5 percent of installed seating.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer certified in writing by the seating manufacturer to be qualified for installation of specified seating.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver seats to project site in unopened containers clearly labeled with manufacturer's name and identification of contents.

B. Store seating units in dry and clean location until needed for installation. During installation, handle in a manner that will prevent marring and soiling of finished surfaces.

1.06 WARRANTY

A. Manufacturer’s Warranty; Submit, for Owners acceptance, manufacturer’s standard warranty documents executed by authorized company official. Manufacturer’s warranty is in addition to, and not a limitation of, other rights Owners may have under Contract Documents.
   1. Warranty period; (10) year warranty on mechanical and structural components free from manufacture defect, commencing on Date of Substantial Completion. Vandalism excluded.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Auditorium Seating:
   1. Sedia Systems, Inc. - Contact: Shannon Jeffries, 619-961-6900. 1820 W. Hubbard Suite 300, Chicago, IL 60622.
      a. Fixed, upholstered auditorium chairs: P10 Auditorium Seating.
      b. Removeable, upholstered auditorium chairs: P10 Auditorium Seating. See drawing detail A4IA-532.
      c. Moveable ADA, upholstered auditorium chair: to match fixed seating.

B. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 FIXED AUDIENCE CHAIRS

A. Fixed seating system designed to permit radial installation using common middle support standards in each row and aisle standards aligned as indicated on drawings. Width of seats not less than 22 inches, except exit seat locations may be reduced to 20 inches to complete specific row dimensions.

B. Backs: Fixed type; two-panel construction with fabric covering over padding and protective back panel, with installed height not less than 32 inches above finished floor.
   1. Fully upholstered 1 .5" thick 1824 density soy based BioComfort polyurethane foam. Inner panel is made of 0.47" thick plywood curved to a radius of 30" and CARB Phase 2 compliant. An outer back panel is secured by two 12-gauge steel hooks. Outer back panels are available in finished wood er-uphosery. Backrest attached with easy mount bent steel brackets. Backrest available in 3 incline positions. Center to center back sizes in 20" , 21", 22", 23", 24". See floor plan

C. Seats: Fixed, removable and movable type, constructed to permit reupholstering with easy removal of seat from chair.
   1. Fully upholstered seat over wood seat pan i bottom with 4" thick 2555 density soy based BioComfort polyurethane foam. Gravity uplift seat with counterweight mechanism allows the seat to return to its vertical position when unoccupied by means of gravity. Nylon pivot block and tri-pin mechanism rotates on center pin with two load distributing stop pins. Composite polypropylene and thermoplastic polyurethane seat pivot dampener for quiet seat closing. Seat has an internal structure in EZ frame plywood with a thickness of 0.75" and CARB Phase 2 compliant. Flammability compliance with California Bulletin 117 is standard.
      a. Fabric: Mamentum Textiles or equal.
         Fiber content and backing: 74% post-esnsumer recycled polyester, 2S% polyester acrylic packing.
      b. Fabric Color: Odyssey C-Zero in Alloy.
      c. Wood seat bottom finish: River Cherry to match back panel.

D. Arm Rests: Locate at aisles and between chairs; mount to support standard with concealed fasteners; exposed surfaces of finished wood with smooth edges.
   1. Finished Wood, Natural Maple.

E. Outer Back Panels: finished wood.
   1. Finish: Finished Wood, River Cherry

F. End Panels: One piece panels fastened securely to aisle standards with concealed fasteners, configured as follows:
   1. Shape: Tapered.
   2. Finish: Finished wood, River Cherry.

G. Finished: All exposed metal parts are stripped and cleaned with iron phosphate, hot water, rinsed and then chromic acid rinsed. All metal parts are coated with an epoxy-polyester powder finish of at least 60 microns

H. Pedestal Support: Heavy 16-gauge tubular steelwith welded 5/16" steel support plate. Open arm structure provides extra seat space and comfort. Structures with scratchproof black colored epoxy-polyester powder paint.

I. Options: Removeable base and ADA transfer seats as indicated on floor plan.

J. Accessories:
   1. Provide fabric slip covers in same upholstery as seats with inscription: "Reserved". Quantity of 8.
   2. Provide plugs at removable bases to close holes when base removed.

2.03 ACCESSORIES

A. Folding Tablet Arms: At standard to right side of each seat, provide manufacturer's standard fold-away tablet arm assembly, with hinge and swivel mechanism securely fastened to underside of writing surface and designed to provide solid support in the open position and semi-automatic return to stowed position beneath right arm rest and parallel to right standard.
   1. Finish: Plastic laminate both sides, with smooth, rounded edges.
   2. Size: Writing surface not less than 100 sq inches.
   3. Quantity: 10. Location indicated on plan.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates for conditions detrimental to installation of fixed theater seating. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Site Verification: Prior to installation verify, with installer present, that substrates and conditions comply with the requirements for construction tolerances.

C. Repair: Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Comply with manufacturer's installation instructions and approved shop drawings.

B. Install following manufacturer's printed instructions for installation and using manufacturer recommended hardware and fasteners.

C. Anchor support standards securely to substrate with at least two anchoring devices recommended by manufacturer.
   1. Vary width of seats and backs as required to optimize sightlines, and comply with the ADA Standards for row and aisle widths.
   2. In curved rows, install standards to form smooth radius, without breaks or angled chords

3.03 ADJUSTING

A. Repair minor abrasions and imperfections in painted finishes with a coating that matches factory-applied finish; replace units that cannot be repaired to unblemished appearance.

B. Replace upholstery fabric damaged or soiled during installation.

END OF SECTION 12 61 00

This page intentionally left blank

SECTION 13 07 00
BULLET-RESISTANT FIBERGLASS ARMOR PANELS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Bullet-resistant fiberglass armor panels. Provide all labor, material, equipment, and services necessary to furnish and install bullet-resistant fiberglass armor panels to be located as shown on the construction.

1.02 RELATED REQUIREMENTS

A. Section 08 34 53 - Bullet-Resistant Doors and Frames

B. Section 09 21 16 - Gypsum Board Assemblies: Finish material over armor panels.

C. Section 09 22 16 - Non-Structural Metal Framing: substructure under armor panels.

1.03 REFERENCE STANDARDS

A. Underwriters Laboratory, UL 752, Current Edition, Standard for Bullet-Resisting Equipment

1.04 QUALITY ASSURANCE

A. Ballistic Performance: Certification shall be furnished indicating that all materials have been tested in accordance with the appropriate test procedures.

B. Obtain bullet-resistant components through one source from a single manufacturer.

1.05 DESIGN

A. To accommodate a radius design to meet UL 752 Level 3, three layers of ArmorCore NIJ Level 1, 3/16” thick, shall be applied to the radius. Through the design, manufacturing technique and material application the Bullet Resistant Fiberglass shall be of the “non ricochet type”. This design is intended to permit the encapture and retention of an attacking projectile lessening the potential of a random injury or lateral penetration.

1.06 SUBMITTALS

A. See Section 01330 - Submittal Procedures.

B. Shop Drawings shall be submitted for approval prior to the shipment of materials. The drawings shall include plan views, elevations, sections, and details of the proposed installation including attachment methods.

C. Drawings shall indicate dimensions, component profiles, and material finishes.

D. Manufacturer’s warranty and product data, glazing product information, and installation instructions shall be included with the submittal package.

1.07 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver the materials to the project with the manufacturer’s labels intact and legible. Handle the material with care to prevent damage. Store the materials inside under cover, stack flat and off the floor.

B. Pack bullet-resistant components on wood palettes for shipment.

C. All items shall be delivered, stored, and handled in a manner that will not damage or deform.

D. Damaged items that cannot be restored to like-new condition shall be replaced.

E. Store crated components in a dry location on platforms or pallets that are adequately ventilated, free of dust, water, and other contaminants, and stored in a manner that permits easy access for inspection and handling.

1.08 JOB CONDITIONS

A. Field Measurements: Contractor shall verify quantities required by field measurement prior to shipment and confirm on Shop Drawings.
   1. Quantities should allow for four-inch battens at all seams.

1.09 WARRANTY

A. Warranty Period: Bullet-resistant components shall be warranted for a period of 24 months from the date of shipment.

B. Warranty is limited to material defects or workmanship and offered to North American Bullet Proof direct customers. Warranty is limited to replacement of product or refund of invoice price at North American Bullet Proof's discretion. Installation, shipping or other cost is not included in this warranty.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Bullet Guard: West Sacramento, CA, Phone # (916) 373-0402, Fax # (916) 373-0208, email: sheila@bulletguardmail.com: Website: www.bulletguard.com.

B. North American Bullet Proof, 106 Guadalupe Drive, P.O. Box 628, Cibolo, TX 78108. Phone 888.746.8427, www.nabulletproof.com.

C. Total Security Solutions: tssbulletproof.com.

D. Armortex, 5926 Corridor Pkwy, Schertz, TX 78154. Phone 210-661-8306, www.armortex.com.

E. Armorcore: 302 S. 27th Street, Waco, TX 76710: Phone 254-752-3622, www.armorcore.com.

F. Substitutions: Refer to Section 01600 - Product Requirements.

2.02 PRODUCT

A. Material: The panels shall be made of multiple layers of woven roving ballistic grade fiberglass cloth impregnated with a thermoset polyester resin and compressed into flat rigid sheets. The production technique and materials used shall provide the controlled internal delamination to permit the encapture of a penetrating projectile. Bullet Resistant Fiberglass panels: 3 layers @ 3/16" maximum thickness and 1.7 pounds per square foot maximum weight.

B. Performance:
   1. Ballistic Resistance Performance Level: U.L. 752 Level 3.
   2. Nominal Thickness: 3-layers at 3/16".
   3. Nominal Weight: 1.7 lbs./s.f maximum weight.
   4. Testing: UL Listed to U.L. 752 to level specified

2.03 LABELING

A. Bullet-resistant components shall be plainly and permanently labeled. The label shall be compatible with finishes. The label shall be visible only on the secure side, after installation, and shall include:
   1. Manufacturer's name or identifying symbol.
   2. Model Number.
   3. Date of manufacture by month and year. This may be done through use of lot number or other traceable code.
   4. Correct mounting position including threat side and secure side (by removable label on glazing material).

PART 3 - EXECUTION

3.01 INSPECTION AND PREPARATION

A. Upon delivery, open the crate and inspect the contents for freight damage. If damaged, notify the freight company of the claim. Check the packing list to make sure all items are present. If any items are missing, notify North American Bullet Proof.

B. Prior to commencing installation, examine all areas to receive the bullet-resistant glazing frames to ensure that they are ready for installation. Components shall be checked and corrected for racking, twisting, and other malformation prior to installation.

C. Verify that the glazing frames comply with indicated requirements for type, size, and location.

D. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Always drill pilot holes in panel to accomodate hanging the material on stud walls. Never screw directly into the fiberglass as this will cause delamination around the screw and void the warranty.

B. At vertical panel joints install 4" (nominal) batten strips of bullet-resistant fiberglass panel every 48" at seams. First, install full-size sheets of bullet-resistant panel on the stud, then install batten strips to cover the seams. Install gypsum board panels fully bonded with construction adhesive to fiberglass panels between the battens. Fill gap created by the difference in the thickenss of the finish material and the battens with gypsum board tape and float material for smooth finish. Inside or outside corner transitions do not require batten.

C. Attach batten into solid framing with one drwall sccrew at 12" oc staggered with wall paneling fasterners.

D. Field cut panels where required with tungston carbide abrasive blade.

E. Install panels with liquid adhesive to each stud with drywall screws at 12" oc along each edge and at 12" oc to each intermediate stud.

F. Screw size, pattern and spacing per manufacturers recommendation.

G. At all penetrations in bullet-resistant fiberplass panel (ie electrical boxes, switches, fire alarm strobes, etc.), install batten strip layer of bullet-resistant fiberglass panel behind box penetration, overlap penetration by 1" minimum around all edges.

3.03 ADJUST AND CLEAN

A. After installation, clean surfaces and touch up any damaged areas.

END OF SECTION 13 07 00

This page intentionally left blank

SECTION 14 20 01
ELEVATORS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. All work required to bring the existing four (4) elevators into compliance with accessiblity and other requirements in accordance with State of California and Federal codes.
   2. No alterations to be performed to controls that trigger the requirements of ASME A17.1 Section 8.7, Alterations.
   3. Elevator fixtures, operating buttons, programming audible and visual signals, direction indicators, floor designations, hardware, timers, testing, etc. as as specified herein.
   4. Door Protection.
   5. Door Operator.

1.02 QUALITY ASSURANCE:

A. Qualifications of Bidder: Installer shall be the existing manufacturer's elevator equipment - Dover / Thyssenkrupp Elevator, or City-approved equal.

B. Requirements of Regulatory Agencies:
   1. Codes: In accordance with the latest applicable edition requirements of the following and as specified:
      a. CBC: California Building Code, Chapter 11B and Chapter 30.
      b. ASME: American Society of Mechanical Engineers - A17.1; Safety Code for Elevators and Escalators, as adopted by Department of Industrial Relations, Subchapter 6. Elevator Safety Orders.
      c. CCR: California Code of Regulations, Title 8, Division 1, Chapter 4, Subchapter 6 Elevator Safety Orders.
      d. CEC: California Electric Code.
      e. ADA: Americans with Disabilities Act.
      f. ADAAG: Americans with Disabilities Accessible Guidelines.
      g. Permits: Arrange for inspections by governing authorities to maintain existing operating permit.

1.03 SUBMITTALS:

A. Shop Drawings: Submit details of all modifications.

B. Samples: Provide full samples of all hardware, buttons and other components which are visible to building occupants, provide 6 inch x 6 inch panels of all sheet material; if material is less than 6 inch wide provide 12 inch lengths.

C. Testing: Provide results by elevator and floor of testing requirements stipulated in Part 3 of this specification.

PART 2 – PRODUCTS:

2.01 DESCRIPTION OF SYSTEMS: WATERFRONT TOWERS – 501 & 509 WEST WEBER AVE, STOCKTON, CA

A. Stops and Floors: Per survey by contractor

2.02 MATERIALS:

A. Stainless Steel: ASTM A167; Type 302 or 304 or match existing.

2.03 FINISHES:

A. Exposed-to-View Surfaces. Provide as follows unless otherwise specified.
   1. Finish Paints: Three coats baked enamel; sand each coat smooth; color to match existing.
   2. Stainless Steel:
      a. Plain: Satin, directional polish, No. 4 unless otherwise specified.

2.04 DOOR PASSENGER TYPE:

A. DOOR OPERATOR: Provide new Closed Loop Door operator. Operator shall be equal to Thyssenkrupp or GAL.

B. DOOR PROTECTION: Test and correct, if required, that during Phase I Firefighters' Service, the doors proceed to close at reduced speed and a loud buzzer sound. Door closing force shall not exceed 2-1/2 ft.-lb. when optical door re-opening device is not in operation, per code. Refer to Part 3.3 - Testing of this specification.

2.05 SIGNALS AND OPERATING FIXTURES:

A. General: Provide signals and fixtures as specified. Location and arrangement of fixtures shall comply with Accessible requirements.

B. Car Operating Panel: Provide new unless otherwise noted.
   1. Car Button: provide minimum 3/4 Inch diameter mechanical, buttons raised 1/8 inch from surrounding surface with square shoulders and with engraved identifications. Buttons shall be equal to Thyssenkrupp, MAD or Innovation. Operation of car or hall button shall cause button to illuminate. Response of car or hall call shall cause corresponding button to extinguish.
   2. Switches: Toggle type or key operated. Match existing equipment type.
   3. Lamps: Miniature LED type.

C. Car Position Indicators: Provide new unless otherwise noted.
   1. Audible indicators shall comply with CBC 11B-407.4.8.2 or as specified herein.
   2. Where non-verbal audible indicators are installed (Refer to CBC 11B-407.4.8.2.1 “Exception") they are to be of the adjustable electronic audible chime type. Bell type gongs are not acceptable. Refer to Part 3.3 - Testing of this specification.

D. Elevator Landing Signals: Provide new unless otherwise noted.
   1. Provide or relocate visible signals that comply with CBC 118-407.2.2.
   2. All elevator landing audible signals comply with CBC 11 B-407.2.2 or as specified herein. Where replacement signals are required, Bell type gongs are not acceptable. Refer to Part 3.3 - Testing of this specification.
   3. Tactile Markings: Provide raised Grade 2 Braille and raised Arabic, numerals or symbols to the left of operating buttons and devices. Designations shall be separate plat s flush mounted with hairline joints and concealed rear mechanical fasteners. Plates shall be of same size and shape as buttons. Raised characters shall be white on a black background with Grade 2 Braille designation directly below the character. All designations shall comply with CBC Section 118-407.4.7.
   4. Emergency Communication Systems: Test and correct any faults discovered with the retained emergency communications system in compliance with C.B.C.11B-407.4.9. Items to be checked and verified include the combination speaker/microphone, amplifier, automatic dialer, push button to activate system and acknowledgement lights. The automatic dialer shall be programmed as directed by City of Stockton. Refer to Part 3.3 - Testing of this specification.
   5. Hall Button Fixtures: Relocate or provide new button boxes and faceplates. All damaged surfaces to be repaired and replaced to the approval of the City of Stockton.
      a. Each faceplate shall be stainless steel or approved equivalent, with the appropriate button(s) raised 1/8 inch above the surface, internally lit to illuminate €1 full white color over the entire surface of each button, to indicate hall call registration, and extinguish when call is answered.
   6. Existing Door Open Timers: Adjust all existing delay timers to comply with the CBC. Adjust elevator doors to remain fully open in response to a car call for minimum of 5 seconds.
   7. Existing Door Re-opening Delay Timers: Adjust all existing door re-opening delay timers to comply with the CBC. Elevator door reopening devices shall remain effective for 20.0 seconds minimum.

8. Lighting Levels: The level of illumination at the car controls, floor level, car threshold and car landing sill shall be a minimum of 5 foot candles (54 lux).

2.06 HOISTWAY ENTRANCES; PASSENGER TYPE:

A. Floor Indicators at Door Jambs: On each side of entrance frame remove existing plates and install new vandal-proof floor designations in both raised characters and Braille on both jambs of elevator hoistway entrances. Provide white characters on black background. Comply with CBC Sections 11B-407.2.3.1 and 118.a703.

PART 3 - EXECUTION

3.01 PREPARATION:

A. Field Measurements:
   1. Field verify dimensions before proceeding with the work.
   2. Erect temporary protection barricades acceptable to City of Stockton Representative, whenever the Contractor staff has the elevator doors, uncoupled and working on outside of elevator or inside when doors are open. Provide satisfactory protection to the finished car floor and walls in the elevator car.

B. Installation: Install per manufacturer's requirements, those of regulatory agencies and as specified.

3.02 FIELD QUALITY CONTROL:

A. Regulatory Agencies Inspection: Upon completion of elevators, Contractor shall conduct all tests required by regulatory agencies. The Contractor shall submit a complete report describing the results of the tests.

B. Examination and Testing: When installation is complete, notify and assist the City of Stockton representative in making a walk-through review of the specified changes and operations to assure workmanship and equipment complies with contract documents. Provide equipment to perform the following tests:
   1. Stop car at each floor in each direction.
   2. Check and verify operation of all modified equipment and elements.
   3. Verify retained signals are operational, per California Building Code.

C. Final Completion: Final acceptance of the installation will be made only after all corrections are complete, final submittals and certificates received and the City of Stockton is satisfied that the installation is complete in all respects and all Contract requirements have been complied satisfactorily.

D. Maintenance Data:
   1. Parts Catalogs: After completion and prior to final completion, submit three sets of complete and accurate parts catalogs for new materials specific for each elevator. Final payment will not be made until received.
   2. Wiring Diagrams: One electronic. Wiring diagrams shall be as built, specific for this installation.

3.03 TESTING

A. In addition to coordinating all inspections required by the California Code of Regulations the contractor is responsible for conducting the following testing:
   1. Test to ensure elevators cars automatically level to all floor landings within a tolerance of plus or minus 1/4 inch under a balanced load.
   2. Test and identify any faults with the retained emergency communications system in compliance with C.B.C.11B-407.4.9. Items to be checked and verified include the combination speaker/microphone, amplifier, automatic dialer, push button to activate system and acknowledgement lights. The automatic dialer shall be programmed as directed by City of Stockton.
   3. Test that the doors proceed to close at reduced speed and a loud buzzer sounds during Phase I Firefighters' Service. Door closing force shall not exceed 2-1/2 ft.- lbf. when

optical door re-opening device is not in operation, per code;

4. Test all elevator landing audible signals comply with CBC 116-407.2.2 or as specified herein. Audible Signals shall be 12dB minimum above ambient, and 75dB maximum· specific to location and during normal operating hours.
5. Test all elevator car audible signals comply with CBC 118-407.8.2 or as specified herein. Audible Signals shall be 12dB minimum above ambient, and 75dB maximum specific to location and during normal operating hours.

END OF SECTION 14 20 01

SECTION 21 01 10

OPERATION AND MAINTENANCE OF WATER BASED FIRE SUPPRESSION SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All Division 21 Sections.

1.02 SUBMITTALS

A. General:
   1. Substitutions and changes from the approved drawings will be a deferred approval item. Such items must be signed by the Architect prior to fabrication or installation.

B. Preparations.
   1. Prior to data collection and compilation, prepare and submit in duplicate an outline of the proposed organization and content.
   2. Compilation: Prepare and collect data concurrently with construction progress. Compile per submitted outline.

PART 2 - PRODUCTS

2.01 OPERATION AND MAINTENANCE MANUALS

A. Form of Submittals
   1. Prepare data in form of an instructional manual for use by Owner's personnel.
      a. Cover: Identify each volume with typed or printed title, "OPERATING AND MAINTENANCE INSTRUCTION". List:
      b. Title of Project.
      c. Provide indexed tabs.
      d. Identify of separate structure as applicable.
      e. Identity of general subject matter covered in the manual.
   2. Format:
      a. PDF.
      b. Provide Manufacturer's printed data.
      c. Drawings:
         1) PDF

PART 3 - EXECUTION

3.01 OPERATION AND MAINTENANCE DATA

A. General: Record data and operation and maintenance data are complimentary. Submittal items which may be required under both categories may be included only under one submittal if a statement to that effect is included in the other submittal.

B. Quality Assurance
   1. Preparation of data shall be done by personnel.
      a. Trained and experienced in maintenance and operation of described products.
      b. Familiar with requirements of this Section.
      c. Skilled as technical writer to the extent required to communicate essential data.
      d. Skilled as draftsman competent to prepare required drawings.

C. Content of Manual
   1. Table of contents for each volume, arranged in systematic order.
      a. A list of each product required to be included, indexed to content of the volume.
      b. List, with each product, name, address and telephone number of:
         1) Contractor
         2) Subcontractor or installer (if different than the contractor).
         3) Maintenance contractor, as appropriate.
         4) Identify area of responsibility of each.
         5) Local source of supply for parts and replacement.
      c. Identify each product by product name and other identifying symbols as set forth in Contract Documents.
   2. Product Data:
      a. Include only those sheets which are pertinent to the specific product.
      b. Annotate each sheet to:
         1) Clearly identify specific product or part installed.
         2) Clearly identify data applicable to installation.
         3) Delete references to inapplicable information.
   3. Drawings:
      a. Supplement product data with drawings as necessary to clearly illustrate.
         1) Relations of component parts of equipment and systems.
         2) Control and flow diagrams.
      b. Coordinate drawings with information in Project Record Documents to assure correct illustration of completed installation
      c. Do not use Project Record Documents as maintenance drawings.
   4. Factory Authorized Start-Up Report.
      a. Provide a factory start-up report for each piece of equipment. Contractor start-up reports, unless contractor is a factory authorized representative will not be allowed.
   5. Copy of each warranty, bond and service contract issued.
      a. Provide information sheet for Owner's personnel, give:
         1) Proper procedures in event of failure.
         2) Instances which might affect validity of warranties or bonds.

D. Manual for Equipment and Systems:
   1. Submit three copies of complete manual in final form.
   2. Content, for each unit of equipment and system, as appropriate.
      a. Description of unit and component parts.
         1) Function normal operating characteristics, and limiting conditions
         2) Performance curves, engineering data and tests.
         3) Complete nomenclature and commercial number of replaceable parts.
      b. Operating procedures:
         1) Start-up, break-in, routing and normal operating instructions.
         2) Regulation, control, stopping, shut-down and emergency instructions.
         3) Summer and winter operating instructions.
         4) Special operating instructions.
      c. Maintenance Procedures:
         1) Routing operations.
         2) Guide to "trouble-shooting"
         3) Disassembly, repair and reassemble.
         4) Alignment, adjusting and checking.
      d. Servicing and lubrication schedule.
         1) List lubricants required.
      e. Manufacturer's printed operating and maintenance instructions.
      f. Description of sequence of operation by control manufacturer.

g. Original manufacture's parts list, illustrations, assembly drawings and diagrams required for maintenance.
   1) Predicted life of parts subject to wear.
   2) Items recommended to be stocked as spare parts.
h. As-installed control diagrams by controls manufacturer.
i. Each contractor's coordination drawings:
   1) As-installed color-coded piping diagrams.
j. Charts of valve tag numbers, with location and function of each valve.
k. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.
l. Other data as required under pertinent sections of specifications.

3. Content for each electric and electronic system, as appropriate.
   a. Description of system and component parts.
      1) Function, normal operating characteristics, and limiting conditions.
      2) Performance curves, engineering data and tests.
      3) Complete nomenclature and commercial number of replaceable parts.
   b. Circuit directories of panel boards.
      1) Electric service.
      2) Controls.
      3) Communications
   c. As-installed color-coded wiring diagrams.
   d. Operating procedures.
      1) Routing and normal operating instructions.
      2) Sequences required.
      3) Special operating instructions.
   e. Maintenance procedures.
      1) Routine operations.
      2) Guide to "trouble shooting".
      3) Disassembly, repair and reassembly.
      4) Adjustment and checking.
   f. Manufacturer's printed operating and maintenance instructions.
   g. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.
   h. Other data as required under pertinent sections of specifications.
   i. Additional requirements for operating and maintenance data: Respective sections of Specifications.

E. Submittal Schedule
   1. Submit tow copies of preliminary draft of proposed formats and outlines of contents prior to start of work.
      a. Architect will review draft and return one copy with comments.
   2. Submit one copy of complete data in final form fifteen days prior to final inspection or acceptance.
      a. Copy will be returned after final inspection or acceptance, with comments.
   3. Submit specified number of copies of approved data in final form 10 days after final inspection or acceptance.

F. Instruction of Owner's Personnel.
   1. Prior to final inspection or acceptance, fully instruct Owner's designated operating and maintenance personnel in operation, adjustment and maintenance of products, equipment and systems
   2. Operating and maintenance manual shall constitute the basis of instruction.
      a. Review contents of manual with personnel in full detail to explain all aspects of operations and maintenance.

END OF SECTION

SECTION 21 05 00

COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. DIVISION 1 GENERAL REQUIREMENTS, apply to the work of this section.

B. All Division 21 Sections.

1.02 SUMMARY

A. Furnish and install all fire sprinkler work shown on the drawings, specified herein, and as required for a complete and functional installation.

B. This section includes materials and methods applicable to the work described in all Division 21 Sections. Specific work requirements of individual Sections take precedence if in conflict with requirements of this Section.

C. All chemicals utilized on site as part of coating, sealant, and other products shall not contain any chemical that is listed as part of Proposition 65 known carcinogens that are identified by NTP, IARC, and the USEPA California Proposition 65 chemical repository contractors are not allowed to bring these chemicals on any California Intel site.

1.03 RELATED SECTIONS

A. Division 26 - Electrical Work

1.04 DRAWINGS AND SPECIFICATIONS

A. For purposes of clearness and legibility, drawings are essentially diagrammatic and, although size and location of equipment are drawn to scale wherever possible, the Contractor shall make use of all data in all the contract documents and shall verify this information at building site.

B. Information presented on Drawings and in the Specifications is based upon latest data available during their preparation. The Drawings and Specifications are for the assistance and guidance of the Contractor and exact locations, distances, levels, etc. will be governed by the structures and the site the contractor shall accept same with this understanding.

C. The drawings indicate required size and points of termination of pipes, and suggest proper routes to conform to the structure, avoid obstructions and preserve clearances. However, it is not intended that drawings indicate all necessary offsets, and it shall be the work of the Contractor to make the installation in such a manner as to conform to structure, avoid obstruction, preserve headroom and keep openings and passageways clear.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Contractor shall be responsible for delivery, storage, protection and placing of all equipment and materials.

B. Equipment stored and installed at the job site shall be protected from dust, water or other damage. Cover all equipment stored exposed to weather.

1.06 STRUCTURAL REQUIREMENTS

A. Structural members shall not be cut or modified in any manner without specific instructions from the structural engineer.

1.07 CODES AND SAFETY ORDERS

A. All work and materials shall be in full accordance with the latest rules and regulations of the State Fire Marshall; the Safety Orders of the Division of Industrial Safety; the I.S.O. codes; the 2019 California Plumbing Code, Title 24, Part 5; the 2019 California Mechanical Code, Title 24, Part 4; the 2019 California Building Code, Title 24, Part 2, 2019 NFPA Codes, and other applicable laws and regulations. Nothing in the Drawings or Specifications shall be construed to permit

1.08 INSTALLATION

A. Manufacturer's Instructions:
   1. When specifications require that installation comply with manufacturer's printed instructions, obtain and distribute copies of such instructions to parties involved in the installation.
   2. Perform work in accordance with manufacturer's instructions. Do not omit any preparatory step or installation procedure unless specifically modified or exempted by specifications.
   3. Handle, install, connect, clean, condition and adjust products in strict accordance with such instructions and in conformity with specified requirements.
   4. Should job conditions or specified requirements conflict with manufacturer's instructions, consult with the Architect for further instructions.
   5. Do not proceed with work without clear understanding.

1.09 PERMITS AND FEES

A. Obtain all permits and pay all required fees for permits and/or utility services. Inspections required during the course of construction shall be arranged as required. On completion of the work furnish the owners representative with certificates of inspection.

1.10 SITE CONDITIONS

A. Assume all responsibility for damage to adjoining properties; and restore property to its original condition, should damage occur as a result of the work of this section. Contractor shall thoroughly familiarize himself with all site conditions. Should utilities not shown on the drawings be found during excavations, promptly notify the Architect for instructions as to further action. Failure to do so will make the Contractor liable for any and all damage thereto arising from his operations subsequent to discovery of such utilities not shown on plans.

1.11 SUBMITTALS

A. General
   1. A submittal schedule shall be issued by the contractor within 15 days of award of the contract. This schedule shall allow for timely review and approval as required by the contract documents.
   2. These requirements apply only to substitutions, submittals, and shop drawings.
   3. The contractor shall review all submittals prior to submission to the Architect. Submittals not reviewed by the contractor will be returned to the contractor and will not be reviewed.
   4. Any deviations from specified requirements shall be clearly indicated in submittals.
   5. Any errors in or omissions from submittals and any consequences of these are the responsibility of the Contractor.
   6. Partial or incomplete submittals may be rejected as not complying with requirements; the Contractor shall be liable for any resultant consequences.
   7. Delayed submittals may be rejected as not complying with requirements. Whether accepted or rejected, delayed submittals will not be considered justification for extension of contract time or similar relief.
   8. Submittals not required or permitted by the Specifications but made at the option of the Contractor, will be returned without review unless accompanied with written valid justification.

9. Submittal items improperly included with those of another category (such as a proposed substitution included with shop drawing submittal) are not valid and will be returned without review.
10. Within 35 calendar days after award of the contract, and before fabrications and installation of any material or ordering of any materials, submit for approval six (6) copies of complete submittal data on specified and proposed substituted equipment and materials. Submittals shall list all materials proposed identified with drawing symbols and specific data on equipment such as arrangements, performance curves, sizes, capacity, motor locations, and other pertinent data. Check all submittals for conformance to the requirements of the Construction Documents before forwarding to the architect for each item. No consideration will be given to substitutions submitted past 35 day limit. The contractor shall be responsible for all quantities and errors and omissions of submittals. Furnish samples when requested.
11. Equipment and materials specified as part of the specifications and drawings are listed by two manufacturer's names. The first named manufacturer is the basis of design. The second named manufacturer has been determined to be an equivalent in quality or utility. The second named has not been specifically determined to conform to the first named in size, layout, electrical power, voltage, or impacts to building structure. The contractor is bound by all requirements for substitutes, as described below, for all second named manufacturers and equivalent equipment or products.
12. Each reviewed submittal will be marked to indicate review and directions as stated below.
13. Acceptance of a submittal does not relieve the Contractor of responsibility for omissions from the submittal or errors in the submittal.

B. Requirements
   1. Submit on all items specified herein:
      a. Shop Drawings as specified by NFPA 13 (for inside the entire buildings and on site)
      b. Material catalog data
      c. Calculations
      d. Welder Certificate for pipe welding
      e. The certificate of flushing and test results (on the National Automatic Sprinkler and Fire Contractors Association [NAS & FCA] form)

C. Review
   1. Submittals will be reviewed for general acceptability, not necessarily including all details. The engineers review is for general conformance with the design concept of the project and the information given in the contract documents. The contractor is solely responsible for confirming and correlating all quantities and dimensions; selecting fabrication processes and techniques of construction; coordinating the work and performing all work in a safe and satisfactory manner. Corrections of comments made on this submittal during this review do not relieve contractor from compliance with the requirements of the contract documents or with its responsibilities listed herein.
      a. Proposed substitutes will be judged not only for the acceptability of the items themselves, but also how they will be used under the conditions of the particular project.
      b. Proposed substitutions will be judged also for compliance with qualifications and conditions stipulated in paragraph 1.13.
   2. Each reviewed submittal will be marked to indicate review and directions as stated below.
      a. Acceptance of a substitute does not waive the specified requirements.
      b. Once a substitution is accepted, no revision or resubmittal may be made except for pressing and valid reason and after receipts of approval to do so.

D. Review Directions
   1. The notation "No Exceptions Taken" indicates that no further submittal on the particular matter is required and that the Contractor may proceed with normally ensuing action. The notation may be applied to submittals on substitutions, shop drawings, record data, or operation and maintenance data. The submittal has only been reviewed for general

conformance with the design concept of the Contract Documents. The contractor is responsible for the dimensions to be confirmed and correlated at the job site; information that pertains solely to the fabrication process or to the means and methods of construction; coordination of the work; and performing all work in a safe and satisfactory manner. This notation does not modify the contractor's duty to comply with the contract documents.

2. The notation "Make Corrections Noted" indicates that no further submittal on the particular matter is required, but the Contractor shall make all changes or corrections noted (but no others) before proceeding with normally ensuing action. The notation may be applied to submittals on substitutions or shop drawings (but usually not record data or operation and maintenance data).
3. The notation "Amend and Resubmit" indicates that the submittal is not accepted and must be revised, resubmitted, and reviewed again. In the case of submittal on substitutions and shop drawings so noted, the Contractor shall not proceed with any normally ensuing action until the resubmittal is reviewed. The notation may be applied to submittals on substitutions, shop drawings, record data, or operation and maintenance data.
4. The notation "Rejected - See Remarks" indicates that the submittal is not accepted and that resubmittal on the same subject matter is not allowed and will not be considered. The notation will be applied normally only to submittals on substitutions (usually not on shop drawings, record data, or operation and maintenance data).
5. The notation "Returned Without Review" indicates that the submittal or item has not been considered officially because it is either not proper, valid, required, or permitted by the Specifications and has no status or effect.

1.12 SHOP DRAWINGS

A. Prepare and furnish complete detailed plans for the installation of an automatic fire sprinkler system which will provide for maximum rate reduction in fire insurance premiums per requirements of, CBC, the State Fire Marshall, and conform to the supply main and riser locations as shown on the drawings.

B. These are working drawings of the building piping, as required by NFPA 13 and 24.

C. Include copies of the hydraulic calculations with each submittal prescribed above.

D. Submit six (6) sets of the above, bearing the "accepted" stamp of the, the local fire department for review and approval. Submit one set of final corrected record drawings. After review, make all corrections required and make final submittal of three (3) reproducible transparencies and 6 blue line sets to the Architect.

E. The drawings submitted by the sprinkler contractor must show sufficient detail and dimensions to clearly indicate that sprinkler lines will be concealed or arranged neatly in exposed areas and will not conflict with structural, mechanical or electrical provisions as shown on the plans. Show feed main hanger locations.

F. Closely coordinate the schedule of this work with the work schedules or all other contractors.

G. The contractor is responsible for providing all shop drawings as described below so that the design professional has the opportunity to determine if the contractor understands the contract documents. It is not the purpose of shop drawings to assure that the contractor is meeting the requirements of the contract documents. Review and approval of a submittal neither extends nor alters any contractual obligation.

H. Accompany all substituted equipment with shop drawings showing revised piping layouts in order to ascertain that substituted equipment does not adversely affect layout or work. Shop Drawings: The following conditions apply to shop drawings:
   1. Shop drawings are not and do not become Contract Documents.

2. Processed shop drawing submittals and any instructions or requirements noted thereon are a part of the work, but they may not be used as a means of increasing the scope of the work.
3. If deviations, discrepancies, or conflicts between shop drawing submittals and the Contract Documents are discovered either prior to or after the submittals are processed, the Contract Document requirements shall govern.

1.13 SUBSTITUTIONS

A. Whenever any equipment, material, or process is indicated or specified by patent of proprietary name and/or name of Manufacturer, in the Specifications and/or on the Drawings, it is understood that such specification is used to facilitate the description of the material and/or process and deemed to be followed by the words "or equal" unless noted "no substitute".

B. Substitute equipment and materials shall be equal in all respects including quality, arrangement, utility, physical size, capacity, and performance to those specified. Approval of substitute material will not relieve the contractor from complying with the requirement of the Drawings and Specifications. The contractor shall be responsible and at his own expense, for any changes caused by proposed substitutions which affect other parts of his own work or the work of other contractors.

C. The submittal of a proposed substitution shall clearly establish the following:
   1. The item can be transported into and installed in the intended space and in the manner shown.
   2. Required connections (electrical, piping, and other) can be properly made and adjoining work can be properly accomplished.
   3. The proposed substitute is similar to and of substance equal to that specified, is suited to the same use as that specified, and will perform the functions required by the design.
   4. Motors for proposed substitute equipment will have the same minimum differential between motor brake horsepower and motor nameplate horsepower as the specified equipment.
   5. All performance requirements shall be at least equal to the specified product or equipment including noise levels, cooling capacity, heating capacity, air flow quantity, etc.

D. By submitting a proposed substitution, the Contractor agrees to the following:
   1. He will assume full responsibility for any and all modifications and necessary alterations arising from the use of the substitute item or material including all cost incurred.
   2. He will assume full responsibility for any delay in the construction schedule resulting from the use of the substitution.
   3. He will prove harmless and indemnify the Owner and the Owner's design consultants from real or alleged damages that may result from the installation, use, or performance of a substitute material or product.

E. The following conditions apply to substitutions:
   1. Submittals of substitutions are not and do not become part of the Contract Documents.
   2. Contractor shall not order, fabricate, use, or install any substitute product or procedure unless he has received acceptance of the substitute from the Engineer.
   3. Should the Contractor install any substitute product in violation of the above he shall remove it and install the specified product at his own expense.
   4. The Contractor shall provide a letter stating that all the above items shall apply to all substituted products and equipment.
   5. Any submittal for substituted equipment or product that does not clearly show that the substituted item is equal shall be marked rejected and no further submittal shall be allowed on the substituted item. Provide in submittal format documentation that the proposed item is exactly as specified in the contract documents.

1.14 GUARANTEE

A. Guarantee all work for one year from date of acceptance, against all defects in material,

equipment and workmanship including repair of damage to any part of the premises resulting from leaks or other defects in material, equipment and workmanship. Guarantee shall be on form supplied by the owner's representative.

1.15 RECORD DRAWINGS

A. Indicate on reproducible drawings the actual location of all piping and equipment as the work progresses. Dimension locations of underground service mains and branches. Deliver the drawings to the architect at the completion of the job.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Shop drawings:
   1. Make all drawings to an appropriate scale, large enough to show all pertinent aspects of the item and the method of its connection into the work.
   2. Make each drawing sheet in a reproducible form (such as CAD, REVIT or PDF)

B. Grouping: Combine submittals in logical groupings; for example, submit Shop Drawings grouped by Sections of the Specifications, arranged in the specified sequence.

C. Shop Drawings: PDF.

D. Content:
   1. Shop drawings may be:
      a. Drawings or diagrams prepared by the Contractor, a supplier, a manufacturer, or other.
      b. Typewritten data or descriptions.
      c. Manufacturer’s printed brochures, descriptions, charts, instructions, or data sheets.

E. Timing: Submit all shop drawings prior to installation of any items included in submittal.

2.02 CORROSION PROOFING

A. Corrosion Proofing / U.V. Protection: Products which will be installed outdoors, exposed to the weather, exposed to moisture, or other potentially damaging conditions shall be constructed to resist the effects of such exposure.

B. Exterior casings shall have lapped or gasketed joints effectively sealed to prevent intrusion of moisture or other injurious substances.

C. Casings, pipes, or product items shall be constructed of materials which are fully resistant to harmful substances they may normally contact, or (if ferrous) shall be galvanized after fabrication, or shall be fully protected from such substances by paint or other coating in appropriate thickness or number of coats.

D. All bolts, nuts, screws, and washers shall be galvanized unless specified to be plated or unprotected.

E. Any exposed plastic pipe must have a U.V. inhibitor.

2.03 MATERIAL AND EQUIPMENT

A. All material and equipment shall be new, of the type, capacity and quality specified and free from defects. All materials and equipment shall be of the same brand or manufacturer throughout for each class of material or equipment wherever possible.

2.04 ACCESS DOORS

A. Unless specified otherwise by the Architect, provide access doors of the following type:

B. Concealed hinges, prime coated with rust-inhibitive paint, style of door to suit wall, ceiling, floor

or roof construction and fire rating.

1. Milcor Type M

2. Milcor Type UFR, fire resistive type Underwriters Laboratory Class B, 1-1/2 hour rating meets CBC, IBCO and BOCA codes for two hour rated walls self latching with key lock, Elmdor/Stonman Type FR or equal.

C. Minimum size; 18" by 18".

D. Wall and ceiling access doors: Furnish as required for access to valves etc.; coordinate size and location to obtain access.

E. See Architectural drawings for further requirements.

2.05 MISCELLANEOUS EQUIPMENT AND MATERIALS

A. Furnish and install miscellaneous equipment and materials required for the systems described whether or not specifically shown or specified.

PART 3 - EXECUTION

3.01 ACCESSIBILITY

A. Do not install any equipment, valve, control, motor, filter, or any other device requiring maintenance or service in an inaccessible location or position. Install access doors as specified herein to render all such equipment serviceable whether specifically shown on the plans or not. Maintain code clearance to all equipment. Coordinate location of doors with lights, etc., and locate symmetrically with same.

3.02 PREPARATION

A. Observations: Check all project drawings and specifications; report any discrepancies before proceeding with the work and in time to avoid unnecessary rework.

B. Investigation: Examine the areas, conditions, and status of other work contiguous or connecting to the work to be performed; ensure that the time of installation is coordinated with other work.

C. Interruptions of Service: Portions of this work may involve connection to existing work, facilities, or utilities ties and may require interrupting shutdowns of same. Carefully plan, coordinate and execute such work so that any interruptions will be kept to a minimum in time and occurrence. Submit request for shutdowns and make shutdowns only after receiving written approval from the Owner.

D. Other: Correct any unsatisfactory conditions that may impede proper execution of the work. Ensure that all arrangements, personnel, materials, and tools are appropriate and adequate before proceeding.

3.03 INSTALLATION

A. General:
   1. Material and equipment incorporated in the work shall be used or applied only for the purpose intended or specified.
   2. Install piping and all equipment that requires access with minimum vertical and horizontal clearances required by OSHA for service.
   3. All shall have 2 inches minimum clearance.
   4. Do not proceed with work without clear understanding.

B. Manufacturer's Instructions:
   1. When specifications require that installation comply with manufacturer's printed instructions, obtain and distribute copies of such instructions to parties involved in the installation.
   2. Perform work in accordance with manufacturer's instructions. Do not omit any preparatory

step or installation procedure unless specifically modified or exempted by specifications.
3. Handle, install, connect, clean, condition and adjust products in strict accordance with such instructions and in conformity with specified requirements.
4. Should job conditions or specified requirements conflict with manufacturer's instructions, consult with the Architect for further instructions.
5. Do not proceed with work without clear understanding.

3.04 DEMOLITION

A. General
1. Procedures shall be determined by the contractor.
2. Demolition work shall not be commenced until all temporary work such as fences, barricades, and any required warning lights and apparatus are furnished and installed and as required by law, regulation, or ordinance, or elsewhere in this specification.
3. Demolition work shall proceed in such a manner as to minimize the spread of dust and flying particles and to provide safe working conditions for personnel.
4. Fires and explosives shall not be permitted.

B. Protection
1. Contractor shall conform to all Federal, State, and local ordinances related to the protection of the public and Contractor’s personnel and the flow of traffic/ Provide protection for persons and property throughout the progress of the work.
2. Existing work damaged by the contractor in the execution of this Contract shall be restored to former condition by the contractor to the satisfaction of the Owner without an increase in the Contract Sum and without an extension of the Contract Time.

C. Disposition of Materials
1. All materials and equipment not scheduled to be salvaged, including debris and all rejected salvaged materials, shall become the property of the Contractor and shall be disposed of off-site in a legal manner. Location of dump and length of hall shall be the contractor’s responsibility.

3.05 LOCATION OF EQUIPMENT AND PIPING

A. Where job conditions do not permit the installation of piping, etc. in the location shown, it shall be brought to the engineer's attention immediately before fabrication of piping, etc. and the relocation required shall be determined in a joint conference.

B. The contractor will be held responsible for the relocating of any items installed without first obtaining the architect’s or engineer’s approval. Remove and relocate such items at The contractors expense as so directed by the architect or engineer.

C. Where piping is left exposed within a room, run in vertical or horizontal planes. Maintain uniform spacing between parallel lines and/or adjacent wall, floor or ceiling surfaces.

D. Horizontal runs of pipe suspended from ceilings shall provide for maximum clearance below.

E. Make minor changes in locations of equipment, piping, etc. from locations shown including minor offsets when directed by the engineer, at no additional cost to the owner.

3.06 CARE AND CLEANING

A. Clean and adjust all equipment at completion of installation to provide operating conditions satisfactory to the engineer. Remove broken, damaged or defective parts; repair or replace as directed by engineer. Remove surface material and debris resulting from this work when directed.

3.07 FLASHINGS

A. Furnish and install a waterproof flashing for each pipe or other penetration through roof or wall. Flashings shall be 4 lb. seamless flashings Semco 1100 series with counter flashing as detailed, except in metal roofs flashing for pipes through roof shall be furnished by the roofing contractor.

Where details are not specifically delineated, submit details for review.

3.08 PAINTING

A. Painting is included under the Painting and Finishing Section. It shall be the responsibility of the Contractor to properly protect all equipment and controls during painting operations and the Contractor shall repair and/or replace any item damaged due to painting that was not properly protected.

3.09 ACCESS DOORS

A. Provide access doors to all concealed equipment, valves, controls, etc. Locate doors where shown or to be coordinated and symmetrically located with lights, diffusers, etc. Access doors furnished and installed by the Contractor.

3.10 RECORD DATA

A. Compilation
   1. Record and collect information concurrently with construction progress and date all entries; make drawing entries within 24 hours after occurrence of change or installation requiring recording. Any concealed work covered before recording data shall be uncovered as directed or as necessary to obtain data.
      a. Record information on drawing prints using an erasable colored pencil (not ink or indelible pencil); describe clearly by note or graphic line as appropriate.
   2. Locate any concealed work adequately to allow future access with reasonable ease and accuracy.
      a. Identify the plan location of all stub outs, pipe lines, etc., which are buried or concealed in the structure, whether installed where shown on the contract drawings or in a different location; show actual field dimensions from column lines, wall lines, or other permanent reference lines or points.
      b. In many cases on the contract drawings, the arrangement of conduits, pipes, and similar items is shown schematically rather than as a precise scaled layout. Identify the actual location of these with horizontal and vertical dimensions. If such lines are exposed or readily accessible, omit dimensional identification.
      c. When any work is installed of size, dimension, slope, or location different from that shown on the contract drawings, note the deviation on the Project Record set. If the variations are substantial or cannot be shown clearly on the record drawings, make a new drawing and attach to the Record set.
   3. On other documents
      a. Where changes occur in specifications, clearly indicate same in ink, colored pencil, or rubber stamp.
      b. Where installed equipment differs from that specified (e.g., by accepted substitution or change order) note in the specifications and include complete data on same.

END OF SECTION

This page intentionally left blank

SECTION 21 05 23

GENERAL DUTY VALVES FOR WATER BASED FIRE SUPPRESSION SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. DIVISION 1 GENERAL REQUIREMENTS, apply to the work of this section.

B. All Division 21 Sections.

1.02 RELATED DOCUMENTS

A. The requirements of DIVISION 1 GENERAL REQUIREMENTS, apply to the work of this section.

B. All Division 21 Sections.

1.03 SUMMARY

A. Furnish and install all mechanical work shown on the drawings, specified herein, and as required for a complete and functional installation.

B. This section includes materials and methods applicable to the work described in all Division 21 Sections. Specific work requirements of individual Sections take precedence if in conflict with requirements of this Section.

1.04 RELATED SECTIONS

A. Division 26: Electrical Work

PART 2 - PRODUCTS

2.01 GATE VALVES

A. Gate valves shall be approved rising stem type (OS&Y).

PART 3 - EXECUTION

3.01 TAMPER RESISTANCE

A. All exposed valves shall be chained to prevent accidental shutting of the valves.

B. All shut off valves shall be equipped with tamper switches.

END OF SECTION

This page intentionally left blank

SECTION 21 05 29

HANGERS AND SUPPORTS FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The requirements of the GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS, SPECIAL CONDITIONS and DIVISION 1 GENERAL REQUIREMENTS, apply to the work of this section.

B. All Division 21 Sections.

1.02 SUMMARY

A. Furnish and install all fire sprinkler work shown on the drawings, specified herein, and as required for a complete and functional installation.

B. This section includes materials and methods applicable to the work described in all Division 21 Sections. Specific work requirements of individual Sections take precedence if in conflict with requirements of this Section.

1.03 SUBMITTALS

A. Submit proposed alternative methods of attachment for review and approval by the Architect, prior to deviating from the requirements given below.

B. For all seismic bracing systems submit structural calculations and details prepared and signed by the Contractors licensed A which include all resultant forces applied to the building structure. Do not overstress building structure. The maximum allowable loads are as indicated in 3.01 of this specification. The submittal data required does not require an analysis of the building structural numbers and their reaction to the loads of the piping. The submittal data needs to address attachment methods and shall include calculations indicating the forces that are applied to the building structure at the point of attachment. Calculations will be reviewed for compliance with design criteria, not for arithmetic.

1.04 RELATED SECTIONS

A. Division 26: Electrical Work

1.05 DRAWINGS AND SPECIFICATIONS

A. Information presented on Drawings and in the Specifications is based upon latest data available during their preparation. The Drawings and Specifications are for the assistance and guidance of the Contractor and exact locations, distances, levels, etc. will be governed by the structures and the site the contractor shall accept same with this understanding.

PART 2 - PRODUCTS

2.01 HANGERS AND SUPPORTS

A. B-Line, Superstrut, Tolco, Grinnell, or equal. Numbers are B-line.

B. Finish: Electro-Chromate or hot dipped galvanized.

C. Individual: B3690, B3100 cleaves or B3110 with H-104 all thread rod. Use B3110 for pipe subject to movement.

D. Trapeze Suspension, for three or more pipes B-Line 1-5/8" width channel or a size suitable for load in accordance with manufacturer's published load ratings. No deflection to exceed 1/180 of a span.

E. Trapeze Supporting Rods: Diameter sufficient to support the load with a safety factor of 5. Anchor rods securely to building structure. See part three for minimum sizes.

F. Pipe Straps: B2007-B2072 for standard pipe, B2000-B2069, copper coated for copper.

G. Size: For insulated pipe - B3690 pipe hangers sized to allow pipe insulation to pass continuously through the hanger.

H. Insulated Pipe Shields: Utilize isolated pipe supports at all insulated pipe hanger locations.

I. Isolators: 319CT or Trisolator isolators at all hangers and clamps supporting un-insulated piping and tubing and at all points that pipe comes in contact with structure or other pipes.

PART 3 - EXECUTION

3.01 HANGERS AND SUPPORTS

A. General: Support all piping so that it is firmly held in place by approved iron hangers and supports and special hangers as required or as scheduled on the drawings.
   1. Rigidly fasten hose faucets, and similar items at ends of pipe branches to the building construction near point of connection.

B. Hanger Installation: On all insulated pipes, install the hangers on the outside of the pipe covering and not in contact with the pipe. Burning, welding, cutting, or drilling on any structural member may only be done if approved by the structural engineer. No valve or piece of equipment shall be used to support the weight of any pipe. Provide a hanger close to the point of change of direction of pipe run in either horizontal or vertical plane. Place supports and hangers for cast iron soil pipe as close as possible to joints; when hangers or supports do not come within one foot of a branch line fitting, install an additional hanger or support at the fitting. Protect insulation, when pipe is insulated, at each hanger with 180 degree, 18 gauge, 12 inch long G.I. Saddles.

C. Hanger Spacing Schedule:

Type of Pipe	1" dia or under	1¼" to 2" dia	2½" dia & over
Steel Pipe	*8' - 0"	10' - 0"	12’ - 0"

D. Rod Size Schedule:

Pipe Size	½” – 2”	2 ½” – 5”	6” – 8”
Rod Size:	$^{3}/_{8}$”	½”	$^{5}/_{8}$”

E. Anchor pipe subject to expansion or contraction in a manner permitting strains to be evenly distributed.

F. Methods of attachment and sizes shall conform to NFPA 13 and FM data sheet 2-8.

G. All hangers and fasteners are subject to the approval of the Structural Engineer.

H. Provide beam clamp retaining straps for all pipe supports attached to structural beams.

I. Support fire-protection system piping independent of other piping.

END OF SECTION

SECTION 21 05 48

VIBRATION & SEISMIC CONTROLS FOR FIRE SUPPRESSION PIPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The requirements of DIVISION 1 GENERAL REQUIREMENTS, apply to the work of this section.

B. All Division 21 Sections.

1.02 SUMMARY

A. Furnish and install all fire sprinkler work shown on the drawings, specified herein, and as required for complete and functional installation.

B. This section includes materials and methods applicable to the work described in all Division 21 Sections. Specific work requirements of individual Sections take precedence if in conflict with requirements of this Section.

1.03 SEISMIC RESISTANCE

A. Furnish and install all systems, units, equipment, and parts to meet or exceed current applicable requirements for seismic resistance specified by codes, regulations, or agencies having jurisdiction. Include all supports, anchors, braces and other restraining devices required. All seismic restraints will meet the following site specific seismic design criteria:
   1. Seismic Design Category D, 2) Importance Factor, Ip = 1.5 and 3) SDS = 0.573
   2. Seismic restraints are the responsibility of the contractor.

PART 2 - PRODUCTS

2.01 BRACING SYSTEMS

A. Provide approved types as manufactured by Tolco or B-Line.

PART 3 - EXECUTION

3.01 SWAY BRACING

A. Provide earthquake sway bracing in accordance with 2019 NFPA 13 and FM data sheet 2-8 on all feed and cross mains to meet current seismic requirements. Install exposed bracing in a neat workmanlike manner.

END OF SECTION

This page intentionally left blank

SECTION 21 07 00

FIRE SUPPRESSION SYSTEM INSULATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The requirements of DIVISION 1 GENERAL REQUIREMENTS, apply to the work of this section.

B. All Division 21 Sections.

1.02 SECTION INCLUDES

A. This Section describes insulation materials, methods, and applications for Fire Sprinkler Work, Special or specific details, applications, features, or methods may be described in work descriptions Sections or on the drawings.

1.03 REFERENCES

A. Thermal insulation materials shall meet the property requirements of one or more of the following specifications as applicable to the specific product or end use:

B. American Society for Testing of Materials Specifications:
   1. ASTM C 547, "Standard Specification for Mineral Fiber Pipe Insulation"
   2. ASTM C 585, "Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System)"
   3. ASTM C 1136, "Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation"

1.04 SYSTEM PERFORMANCE

A. Insulation materials furnished should meet the minimum thickness requirements of National Voluntary Consensus Standard 90.1 (Latest edition), "Energy Efficient Design of New Buildings," of the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE).

B. Insulation materials furnished and installed hereunder shall meet the fire hazard requirements of applicable building codes when tested in composite form per one of the following nominally equivalent test methods:

C. American Society for Testing of Materials: ASTM E 84

D. Underwriters' Laboratories, Inc.: UL 723, CAN/ULC-S102-M88

E. National Fire Protection Association: NFPA 255

F. Molded pipe insulation shall be manufactured to meet ASTM C 585 for sizes required in the particular system.

G. Molded fibrous glass pipe insulation shall comply with the requirements of ASTM C 547.

1.05 QUALITY ASSURANCE

A. Qualifications of Installers: only a licensed firm employing installers specifically skilled and experienced in applying insulation to piping shall do Insulation work.

B. Insulation materials and accessories furnished and installed hereunder shall, where required, be accompanied by manufacturers' current submittal or data sheets showing compliance with applicable specifications listed in above.

C. Insulation materials, including all weather and vapor barrier materials, closures, hangers, supports, fitting covers, and other accessories, shall be furnished and installed in strict accordance with project drawings, plans, and specifications.

D. Insulation materials and accessories shall be installed in a workmanlike manner by skilled and experienced workers who are regularly engaged in commercial insulation work.

1.06 CODES AND STANDARDS

A. California Code of Regulations - Title 24.

B. National Fire Protection Association - 90A.

C. LEED Submittals – Provide MSDS or other manufacturers documentation with disclosure of VOC content for all wet-applied products.

D. Product requirements – All adhesives/sealants wet-applied on site must meet applicable chemical content requirements of SCAQMD.

1.07 DELIVERY AND STORAGE OF MATERIALS

A. All of the insulation materials and accessories covered by this specification shall be delivered to the job site and stored in a safe, dry place with appropriate labels and/or other product identification.

B. The contractor shall use whatever means are necessary to protect the insulation materials and accessories before, during, and after installation. No insulation material shall be installed that has become damaged in any way.

C. If any insulation material has become wet because of transit or job site exposure to moisture or water, the contractor shall not install such material, and shall remove it from the job site. An exception may be allowed in cases where the contractor is able to demonstrate that wet insulation when fully dried out (either before installation or afterward following exposure to system operating temperatures) will provide installed performance that is equivalent in all respects to new, completely dry insulation. In such cases, consult the insulation manufacturer for technical assistance.

D. Batt acoustical insulation for interior wall construction.

E. Batt thermal insulation for exterior wall construction.

1.08 REFERENCES

A. ASTM C665 - Mineral Fiber Blanket Thermal Insulation

1.09 REGULATORY REQUIREMENTS

A. Comply with Title 24, Part 2, Chapter 7, fire resistivity ratings.

1.10 SUBMITTALS

A. Product Data:
   1. Submit materials list in accordance with Section 01330.
   2. Prepare complete materials list identifying specific insulation types and applications.

1.11 PRODUCT HANDLING

A. Protection:
   1. Deliver, store and handle all products in a manner to prevent damage and deterioration.
   2. Use all means necessary to protect the installed work and materials.
   3. Deliver all materials in unopened bundles, labeled with date of manufacturer and testing agency approval.

PART 2 - PRODUCTS

2.01 FIRE SUPPRESSION SYSTEMS PIPING INSULATION: SEE 21 07 19

PART 3 - EXECUTION

3.01 APPLICATION / INSTALLATION

A. Use the types and thickness of insulation specified in work description Sections.

B. Apply insulations in accordance with the manufacturer's recommendations and with instructions specified herein or noted on the drawings.

C. Install insulations only after the systems, items, and equipment have been installed and tested, inspected, and accepted. Exceptions: Slip-on piping insulation and equipment insulations installed at the factory.

D. Fit insulation snugly to the item being insulated; butt all joints tightly with no voids, spaces, or thin spots.

E. Seal all joints completely; where sealing tape is used, center the tape over the joint.

F. Except where specified or necessary, do not use staples or fasteners which penetrate vapor barrier jackets or covers on cold systems or equipment; where such penetrating fasteners are used, seal each penetration completely to maintain the vapor barrier integrity. All penetrations of the ASJ and exposed ends of insulation shall be sealed with vapor barrier mastic. Vapor seals at butt joints shall be applied at every fourth pipe section joint and at each fitting to provide isolation of water incursion.

G. Use adhesives, mastics, cements, sealants, and finishes undiluted unless specifically directed otherwise; apply per manufacturer's directions.

H. Install outdoor jacketing or other specified weather proofing or finishing on all insulations outdoors.

I. Install all indoor exposed insulation with extra care and finish neatly.

J. Follow specified methods of installation unless alternative methods are submitted and approved.

3.02 FINISHING

A. Finishes and Protection:
   1. Insure that the exterior finish of all insulation is applied and complete as specified
   2. Make ready for painting, or painted to match existing including color where specified for paint.
   3. Install all metal jackets or protective sheathing where specified.

B. Repair, Touchup: Properly repair and touchup all dents, rips, tears, or other damage inflicted on jackets or exterior surfaces of insulation. Breaks or punctures in the vapor barrier of external insulation will not be accepted and must be repaired prior to project acceptance.

END OF SECTION

This page intentionally left blank

SECTION 21 07 19

FIRE SUPPRESSION SYSTEMS PIPING INSULATION

PART 1 - GENERAL

1.01 GENERAL

A. A continuous, intact vapor barrier is critical for all pipes conveying fluids at temperatures less than 75º F.

B. All insulation material shall have a mold, humidity, and erosion resistant face, that meets the requirements of CMC Standard No. 6-1.

C. Insulation applied to the exterior surface of pipes located in buildings shall have a flame spread of no more than 25 and a smoke developed rating of not more than 50.

D. All requirements of Section 21 07 00 apply to this section.

PART 2 - PRODUCTS

2.01 IP-3 ELASTOMERIC FOAM

A. Insulation shall be Elastomeric Foam Insulation. Insulation should have a maximum service temperature of 210º F, a minimum service temperature of –40º F., and a "K" factor of .28 at 75º F. The flame spread of the insulation shall be 25 or less, and smoke density shall be 50 or less when tested in accordance with ASTM E84.

B. Provide U.V. protective coating for all outdoor applications.

C. Rubatex R-180-FS/R-1800-FS, Armstrong Armaflex or equal.

PART 3 - EXECUTION

3.01 PIPING APPLICATIONS

A. Fire Sprinkler Piping: Insulate all piping exposed outside of exterior walls, on the roof and under canopies.
   1. Use System IP-3 (Elastomeric Foam).
      a. 1” thickness with U.V. protection for all sizes.

3.02 INSTALLATION

A. Unless specifically excluded herein or on the drawings, insulate all parts of the piping systems, including fittings, flanges, valves, and pipe-mounted devices, except do not cover nameplates on devices.

B. Install insulation in removable sections over unions, flanges, and line components or devices requiring periodic maintenance.

C. Install insulation butted tightly to transitions such as insulated pipe shields, insulated pipe sleeves, equipment connections, etc.

D. Install insulation on piping systems so that condensation will not occur. Insulate pipe supports where hanger is directly in contact with pipe up to the point of connection to the building structure. All piping shall be supported in such a manner that neither the insulation nor the vapor/weather barrier is compromised by the hanger or the effects of the hanger. In all cases, hanger spacing shall be such that the circumferential joint may be made outside the hanger. On cold systems, vapor barrier shall be continuous, including material covered by the hanger saddle.

E. Install insulation materials with smooth and even surfaces. Insulate each continuous run of piping with full-length units of insulation, with single cut piece to complete run. Do not use cut pieces or scraps abutting each other. Butt insulation joints firmly to ensure complete, tight fit over all piping surfaces.

F. Maintain the integrity of factory-applied vapor barrier jacketing on all pipe insulation, protecting it against puncture, tears or other damage. All staples used on cold pipe insulation shall be coated with suitable sealant to maintain vapor barrier integrity.

END OF SECTION

SECTION 21 08 00
COMMISSIONING OF FIRE SPRINKLER SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. Related Documents:
   1. Drawings and general provisions of the Subcontract apply to this Section.
   2. Review these documents for coordination with additional requirements and information that apply to work under this Section.

B. Section Includes:
   1. General requirements that apply to implementation of commissioning of fire suppression systems, assemblies and components.

C. Related Sections:
   1. Division 01 Section "General Requirements."
   2. Division 01 Section "Special Procedures."
   3. Division 21 Fire Suppression Sections.

1.02 REFERENCES

A. General:
   1. The following documents form part of the Specifications to the extent stated. Where differences exist between codes and standards, the one affording the greatest protection shall apply.
   2. Unless otherwise noted, the referenced standard edition is the current one at the time of commencement of the Work.
   3. Refer to Division 01 Section "General Requirements" for the list of applicable regulatory requirements.
   4. Refer to Division 21 Section "Common Results for Fire Suppression" for codes and standards, and other general requirements.

1.03 DESCRIPTION

A. The purpose of commission is to ensure the University that work has been completed as specified and that systems are functioning in the manner as described in Division 21 Section and specified system operating criteria. It will assist operating staff training and familiarization with new systems. It will serve as a tool to reduce post-occupancy critical systems operational difficulty or failure. It will, also, be used to develop test protocol and record the associated test data in an effort to advance the building systems from a state of substantial completion to a full dynamic operation.

B. Commission will commence after preliminary punch list items are completed by Contractors.

C. The steps associated with commissioning are outlined below:
   1. Step One - Installation Verification
   2. Step Two - System Start-Up.
   3. Step Three – Functional Performance Testing.

D. Operational staff training is essential to the commission process and will run concurrently with steps one through three.

E. The Commissioning Team will include Construction and Installing Contractors, Test and Balance Contractor and Commissioning Agent. Equipment manufacturer's representatives will be present for start-up as specified in the equipment specification sections and for equipment training.

1.04 SYSTEMS TO BE COMMISSIONED

A. Commissioning will be performed on the following systems:
   1. Fire sprinkler system
   2. Fire Pump

1.05 SUBMITTALS

A. Submit under provisions of Division 21 Section "Common Results for Fire Suppression - Review of Materials" and Division 01 Section "General Requirements."

B. Commissioning Plan as prepared by the Commissioning Agent.

C. Commissioning Agent shall provide Functional Performance Tests (FPT) procedures for the above listed systems. Commissioning Agent shall provide system narrative descriptions as part of the FPT procedures.

PART 2 - PRODUCTS

2.01 COMMISSIONING PLAN

A. The commissioning plan shall outline the organization, scheduling, team members, and documentation pertaining to the overall commissioning process.

2.02 NARRATIVE DESCRIPTIONS

A. A narrative description of the design intents of the systems and their intended modes of sequences of operation.

2.03 FUNCTIONAL PERFORMANCE TESTS (FPT) PROCEDURES

A. The FPT procedures at the minimum shall consist of the following sections:
   1. Narrative Description:
      a. This section provides a narrative description of the design intents of the systems and their intended modes of sequences of operation.
   2. Testing Prerequisites:
      a. This section contains verification that primary mechanical, electrical, and controls systems that support or interact with the system that the FPT is prepared against are completed, tested and operational.
   3. Installation Verification:
      a. This section contains verification that the system installation is completed and is ready for commissioning.
   4. Commencement of Functional Performance Testing:
      a. This section records the date and time of the start of system commissioning.
   5. System Condition Prior to Staring Performance Testing:
      a. This section records the current set points and parameters of the system at the start of commissioning.
   6. Functional Performance Test:
      a. This section shall provide the following:
         1) Sequential steps required to set parameters and conditions required to test component and functions throughout intended ranges of operation.

2) Full range of checks and tests carried out to determine if electric and pneumatic connections, components, subsystems, systems and interfaces between systems function in accordance with the contract documents and design intents.
3) All modes and sequences of control operations, interlocks and conditional control responses and specified responses to abnormal emergency conditions.

7. End of Functional Performance Test:
   a. This section records the date and time of the end of system commissioning.
8. Field Notes:
   a. This section records notes or remarks during system commissioning.
9. List systems modifications, not required by the Contract Documents, but provided by the Contractor. List other questions regarding such system modifications.
10. List problems discovered during Commissioning that were corrected.
11. List problems discovered during Commissioning that were not corrected.
12. List recommended party that should take action on these problems.

PART 3 - EXECUTION

3.01 GENERAL

A. The Contractors shall be responsible for performing procedures presented in specification and contract drawings as detailed in the Functional Performance Tests (FPT). Members of the designated Commissioning Team shall witness various portions of the commissioning process. Responsibilities for these activities are listed in the following paragraphs. Commissioning Team members shall sign-off on appropriate sections after verifying installation, operation, or documentation. Final sign-off shall be by the University and Commissioning Agent.

B. Any test ports, gauges, test equipment, etc., needed to accomplish the functional performance tests shall be provided by Contractors.

C. Contractors shall provide to the Commissioning Team documentation of calibration of controls. Documentation shall include dates, setpoints, calibration coefficients, control loop verification, and other data required to verify system check-out. Documentation shall be dated and initialed by field engineer or technician performing the work.

3.02 OPERATIONAL STAFF TRAINING

A. System narrative descriptions will be prepared by the Commission Agent and supported by flow diagrams, one-line diagrams, and appropriate specification sections for major systems to be commissioned. The Commission Agent will coordinate “system description” meetings with members of facility management and maintenance department groups to review system description documentation. The meetings will provide an overview of major system features, components, and arrangements.

B. The Contractor and associated manufacturer’s representatives shall provide required training to operational staff after the system description meetings have occurred. The Contractor training sessions shall provide a more detailed analogy of systems operation and maintenance.

3.03 INSTRUMENTATION

A. Instrumentation will be provided by the Contractor. Instruments used for measurements shall be accurate. Calibration histories for each instrument shall be available for examination. Calibration and maintenance of instruments shall be in accordance with the requirements of NEBB or AABC Standards.

B. Application of instruments and accuracy of measurements shall be in accordance with NEBB or AABC Standards.

3.04 DOCUMENTATION

A. The installing Contractor shall be responsible for collection of pertinent data during system start-up and functional performance testing. The Contractor shall submit to the Commissioning Agent documentation of tests performed prior to and after system start-up. Documentation shall also include start-up procedures as approved by Commissioning Team.

B. Provide a title sheet for each volume and list the following:
   1. Volume Title and Section Name and Number requiring this submittal.
   2. Project name, project number, and address.
   3. Contractor name, address, and phone number.
   4. Name, title, signature, and date of person making the submittal.
   5. Name of University, a blank line for signature, and the date of person accepting the submittal.
   6. Name, address, and phone number of Commission Agent; a blank line for signature; and date of person accepting the submittal.

C. Provide a Table of Contents for multiple submittals. List each submittal and page number. Number each page, centered on the bottom in sequential numerical order. Provide tabs for multiple submittals in a single binder.

3.05 STEP ONE - INSTALLATION VERIFICATION

A. General Commissioning responsibilities:
   1. Before system start-up begins, the Commission Team shall conduct a final installation verification audit. The Contractor shall be responsible for completion of work including change orders and punch list items to the University's satisfaction. The audit shall include, but not be limited to, checking of:
      a. Piping specialties including balance, control, and isolation valves.
      b. Ductwork specialty items including turning devices, balance, fire, smoke, control dampers, and access doors.
      c. Control sensor types and location.
      d. Identification of piping, valves, equipment, controls, etc.
      e. Major equipment, pumps, valves, starters, gauges, thermometers, etc.
      f. Documentation of prestart-up tests performed, including manufacturer's factory tests.
   2. If work is found to be incomplete, incorrect, or non-functional, the Contractor shall correct the deficiency before system start-up work proceeds.

3.06 STEP TWO - SYSTEM START-UP

A. General Commissioning Responsibilities:
   1. A start-up plan shall be developed and submitted by the installing Contractor. Start-up plan to include the following:
      a. Flushing and cleaning of pipe.
      b. Filters, strainers, and screens.
      c. Valve/damper positions.
      d. Electrical tests.
      e. Pressure tests.
      f. Safeties.
      g. Chemical treatment.
      h. Manufacturer's tests.
   2. The start-up plan will be reviewed and a prestart-up inspection performed by designated members of the Commissioning Team. The installing Contractor shall commence with system start-up after approval has been given to start-up plan and the prestart-up inspection is completed. Designated members of the Commissioning Team shall witness system start-up and list system and equipment deficiencies noted during start-up. The Contractor shall

take corrective action on system deficiencies noted and demonstrate to the Commissioning Team members suitable system operation.

3. Designated systems requiring test and balance work shall have this activity commence after systems have successfully completed start-up. System and equipment deficiencies observed during this activity is to be noted and corrected.

3.07 STEP THREE - FUNCTIONAL PERFORMANCE TESTING

A. General Commissioning Responsibilities:

1. Functional Performance Testing begins after operational testing, adjusting, and balancing of the systems have been completed by the Contractors; and the System Description and Hands-on Training sessions have been completed.
2. The objective of the Functional Performance Testing is to advance the building systems from a state of substantial completion to full dynamic operation in accordance with the specified design requirements and design intent.
3. Attaining this object will be accomplished by developing individual systems testing protocols which, when implemented by the Contractor, will allow the Commissioning Team to observe, evaluate, identify deficiencies, recommend modifications, tune, and document the systems and systems equipment performance over a range of load and functional levels.
4. Functional Performance tests for the systems to be commissioned are defined in the Commissioning Plan. These tests are intended to be conclusive but may require minor modifications as system operation dictates.

END OF SECTION

This page intentionally left blank

SECTION 21 13 13
WET PIPE SPRINKLER SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All Division 21 Sections.

1.02 SUMMARY

A. General: Furnish and install all engineering, design, materials, tools, equipment and perform all labor necessary for the complete installation of a fire sprinkler system and related items to provide complete functional systems in accordance with the requirements of NFPA 13 and the 2019 CBC, in all areas of the building.

B. Each system to include, but not limited to:
   1. All pipe, fittings, sprinklers, hangers, valves, braces and all other accessories as necessary or required for a complete and operational system complying with all applicable codes.

C. The contractor is responsible for securing approval from all agencies before submitting to the architect's office.

D. System design criteria and water supply information shall be obtained from City Fire Marshal prior to bid. The Contractor shall perform a water flow test at the nearest fire hydrant prior to commencing design of the fire sprinkler system.

E. Contractor shall provide seismic isolation at all building seismic joints. See 21 05 48.

1.03 QUALITY ASSURANCE

A. Standards: The system shall conform to the requirements of the National Fire Protection Association Standards for the Installation of Sprinkler Systems (NFPA 13, and 20). Provide coverage for various hazards in accordance with NFPA and local Fire Department requirements.

B. The system may be a "scheduled" pipe sized system or "calculated" pipe sized system that satisfies the 2019 CBC, NFPA - 13 requirements. Details and computations for calculated systems must be submitted for approval. Pipe sizes shown outside buildings and for risers are minimum regardless of hydraulic calculations.

C. Qualifications of Installers: A firm licensed to engineer and install fire protection systems such as that specified herein shall perform this work; the installing firm must also be regularly and currently engaged in the installation of such systems.

PART 2 - PRODUCTS

2.01 GENERAL

A. All materials and equipment shall be new and of latest design of the manufacturer and shall be tested and approved by the Underwriters Laboratories, Inc. and Factory Mutual.

B. Sprinkler heads: Regular automatic closed type heads, fusible link of temperature rating

(indicated below or required by NFPA). Standard semi-recessed type heads (+ 7/8 below ceiling) shall be used at all finished ceiling and soffit locations. Heads in walls where freezing may occur (exposed to weather) shall be "dry pendant" sidewall type. Heads in areas without ceilings shall be standard pendant type. Escutcheons and canopies in lay-in ceilings shall be provided by the same manufacturer. Finishes shall be selected from the manufacturers standard range by the Architect prior to ordering. The contractor shall coordinate with the Architect.

C. Spare Sprinkler Heads: Furnish spare sprinkler heads placed in an emergency cabinet. For each cabinet provide one sprinkler wrench. The cabinet will be of No. 20 gauge pressure steel with red lacquer finish complete with manufacturer standard labeling. The spare heads shall be representative of, and in proportion to, the number of each type and temperature of heads installed. Locate cabinet where shown on plans or as directed by owner.

2.02 PIPE AND FITTINGS

A. Pipe fittings for installation below ground shall be cement lined, cast iron conforming to the requirements of American Water Works Association Standard Specification for cast iron special castings, Class D, 150 lb., AWWA C151 mechanical or push-on joint; with AWWA C104 cement-mortar lining, "Blue Brut" or PVC pressure pipe AWWA C900, UL approved for fire line service. If PVC permastran pipe is used with mechanical joint fittings, install according to manufacturer's requirements and recommendations.

B. Fire sprinkler piping, base of riser to 5’-0” outside building (Below ground):

C. Pipe: Acceptable piping materials are Class 50 cement-lined ductile iron with a working pressure of 250 psi per NFPA 24. All piping shall be listed for fire protection service.

D. Fittings: Fittings shall be rated to a minimum of 250 psi and meet applicable requirements of ANSI/AWWA and NFPA 24.

E. Materials shall comply with NFPA / ANSI & AWWA

F. The flange and spigot piece at the base of the riser shall be secured to the underground elbow at the base of the riser with four ¾" stainless steel tie rods for 8” risers, and two ¾" rods for 6” risers (for underground supply piping).

G. Pipe for installation above ground shall conform to ASTM A 795, A 53, or A135. Thin wall pipe with Victaulic couplings may be used for fire lines 2" and larger. Piping for line sizes 1½" and smaller shall be Schedule 40 pipe with screwed fittings. No thin wall pipe shall be used in conjunction with screwed fittings.

H. Gate valves shall be approved rising stem type (OS&Y).

I. All exposed valves shall be chained to prevent accidental shutting of the valves.

J. Sprinkler riser assemblies shall comply with all applicable codes. Furnish dry pipe valve and air compressor for all dry pipe systems. Provide insulation and heat tracing for riser freeze protection. All shut off valves shall be equipped with tamper switches.

K. Supports, Anchors, Bracing – See All Sections 21 05 29 and 21 05 48.

L. Piping Penetration Auxiliaries: Conform to NFPA 13 and the following:

M. Sleeves: Pipe Shields Inc., Model WFB, galvanized steel.

N. Plates/Collars: 24-gauge galvanized sheet metal. Escutcheons: Polished chrome plated brass or painted metal.

2.03 SYSTEM TYPE (BUILDING)

A. The fire protection system for this building shall be “WET” system, in accordance with NFPA 13 requirements.

B. All heads exposed to freezing conditions shall be dry pendant type heads. All piping shall be run inside building lines on the warm side of the building insulation.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General
1. Install all work in accordance with requirements of NFPA 13 and the Fire Marshal. Notify the Fire Marshal in a timely manner when the installation progressed for required inspections.
2. Coordinate the installation of this work with adjacent or related work under other sections of the specifications. Any installed fire sprinkler work which interferes with other work or fails to meet the requirements of the Fire Marshal (as determined by progress or final observation) will be rejected and shall be removed, replaced, or revised to an acceptable condition at the contractor's expense.
3. Fire sprinkler, lines routed outside of the building insulation in soffits, overhangs, under canopies, or in ventilated un-insulated attics shall be protected by a “dry” compressed air charged or anti-freeze system.
4. Coordinate and install the work of this Section with related or adjacent work specified under other sections of the specifications.
5. System piping volume shall be capable of achieving water delivery to the inspector’s test pipe in less than sixty seconds, starting at the normal air pressure on the system and with any quick opening devices in operation.
6. Cutting, Notching and Patching:
   a. Unless noted otherwise on Drawings, provide all cutting and notching required for work of this Section, including concrete saw cutting and core drilling; obtain Architect's approval before cutting or core drilling.
   b. Provide all patching required for work of this Section, including concrete replacement; patch to match adjacent work and to architect's satisfaction.
   c. Any fire sprinkler pipe located outside of the buildings shall be protected with heat tape.

B. Piping
1. Above-grade piping
   a. Use no coupling except where length of pipe between fittings exceeds 20 feet.
   b. Make reductions in pipe sizes with one piece reducing fitting. Bushings shall not be acceptable, except when standard fittings of proper size are not manufactured. Single bushings of the face type will be permitted up to 5% of total number of

reducing fittings in the system. Where bushings are used, install with outer face flush with face of fitting opening being reduced.

c. Install piping to clear lighting fixtures, air ducts, and other obstructions, minimum clearance 2 inches including concrete foundations, walls, and floors.

d. All sprinkler piping shall be inspected prior to installation to ensure the pipe is free of welding slag and cutouts, and ensure that the welded fittings do not protrude into the path of water flow.

e. Install piping level, plumb, and parallel to structure line except where shown otherwise or required by function or regulation to be angled or sloped.

f. Install piping concealed within penetrations provided in the structure except where shown as exposed.

g. Install piping without bending, springing, forcing, or placing undue stress on the pipe or fittings.

h. Install piping to allow for expansion, contraction, and structural settlement.

i. Install piping so it does not directly contact the structure except where shown or specified otherwise.

j. Install piping so that it does not interfere with equipment access.

k. The use of plain end pipe, fittings and coupling shall not be permitted, except for welded piping.

l. Penetrations through fire rated walls shall be sealed in accordance with a recognized UL/FM assembly.

C. Drains

1. Install auxiliary drains at all low points in the system. Install the inspector's test drain at most remote high point in each system from the main riser. All inspectors' test connections shall be installed in a readily accessible location. Use angle type drain valves. Five or fewer trapped heads may be drained through a plugged fitting. Pipe drain valves shall discharge as shown on the drawings, and as approved by the architect, outside building unless noted otherwise. Install in accordance with NFPA 13.

2. All piping in finished areas must be run concealed above ceilings, in walls or as shown and noted on the plans. Piping shall be run so as to occur on the warm side of all building insulation. The location of exposed piping, if permitted at all, shall be approved by the architect.

3.02 SPRINKLER HEAD LOCATIONS

A. Sprinkler heads shall be located in finished ceilings, soffits, overhangs, etc., in accordance with NFPA and CBC requirements but conforming to ceiling lighting, and building modules which may require additional heads for symmetry.

B. Sprinkler heads in the areas without ceilings shall be located on exposed piping run to conform to building lines and as approved by the Architect. The location of all piping, heads and equipment shall be submitted for final approval by the Architect who shall have final authority of location of same. The contractor shall allow for additional sprinkler heads which may be required for aesthetic purposes.

C. Heads in exterior walls and exterior soffits shall be located as shown on architectural exterior elevations or as approved by the architect.

3.03 COORDINATION

A. The contractor shall be responsible to coordinate the location of sprinkler piping with all other trades such as ductwork, electrical work and plumbing work. The contractor shall off-set and modify the sprinkler system as may be required to coordinate the sprinkler system with all other systems as shown and/or detailed. All sprinkler piping shall clear all other building services by at least 2 inches.

3.04 REPORTS

A. The system(s) must be inspected, tested, and approved and certified by the owner's insurance carrier and local fire department before acceptance of the project.

3.05 DETECTION, ALARM, AND ELECTRICAL WIRING

A. contractor shall be responsible for all fire detection and alarm and wiring.

B. Demonstrate proper operation of alarm systems.

END OF SECTION

This page intentionally left blank

SECTION 21 22 00
CLEAN AGENT FIRE SUPPRESSION

PART 1 – GENERAL

1.01 INTENT OF SPECIFICATIONS

A. This specification outlines the requirements for a total flooding clean agent fire extinguishing system comprising Kidde Fire Systems equipment employing 3M™ Novec™ 1230 Fire Protection Fluid with a Aries Netlink Control Unit alarm and releasing panel. All requirements outlined in this specification shall be completed in their entirety. These requirements, which are in accordance with the items listed in Section 1.3, combined with good engineering practices must be followed in order to produce a safe and effective fire protection and suppression system.

B. The contractor shall provide all requirements as specified in 2015 NFPA 2001 as adopted in the 2019 CFC Ch. 80 for the deferred approval plans and specifications.

1.02 GENERAL DESCRIPTION

The clean agent fire extinguishing system shall perform as outlined in the following sub-sections.

A. Achieve a 4.5% (v/v) extinguishing concentration for Class A (Surface Type Fires) hazards.

B. Achieve a 5.85% (v/v) or greater, as required, extinguishing concentration for Class B (Flammable Liquids) hazards.

C. Achieve a 4.5% (v/v) extinguishing concentration for Class C (Energized Electrical Equipment) hazards.

D. Within 10 seconds, the clean agent fire extinguishing system shall discharge 95% of the required suppression agent mass.

E. The clean agent fire extinguishing system shall consist of one or more Kidde Fire Systems agent storage containers and related equipment. The containers may be either connected to a discharge pipe arrangement separately or connected to a common manifold and discharge pipe arrangement. The agent storage containers shall be filled with Novec 1230 fluid, and super pressurized with dry nitrogen to a working pressure of 360 PSIG at 70°F (24.8 bar gauge at 21°C).

F. The Kidde Aries Netlink addressable, distributed-intelligence control unit and fire alarm/suppression system shall perform fire alarm, supervisory, and trouble event initiation; occupant notification; event annunciation; local control functions; fire extinguishing system release, and off premises transmission.

G. The system's distributed intelligence shall extend to the SmartOne automatic initiating devices on the signaling line circuit. Each automatic initiating device shall have a microprocessor capable of independently determining whether or not a fire signature at its monitored location is of sufficient magnitude to warrant the issuance of an alarm signal to the control unit.

H. The contractor shall include all calculations and references on the deferred approval package submittal.

1.03 CODES AND COMPLIANCE

A. The design, installation, testing and maintenance of the integrated suppression shall be in accordance with the following applicable codes, standards and regulatory bodies:
   1. 2015 NFPA 2001 Clean Agent Fire Extinguishing Systems
   2. 2020 NFPA 70: National Electrical Code (NEC)
   3. 2019 NFPA 72: National Fire Alarm Code

4. 2020 NFPA 75: Protection of Electronic Computer/Data Process Equipment
5. 2020 NFPA 76: Fire Protection for Telecommunications Systems
6. UL 864, 9th ed: Control Units and Accessories for Fire Alarm Systems
7. UL 2166: Halocarbon Clean Agent Extinguishing System Units
8. UL 268: Standard for Smoke Detectors for Open Areas
9. UL 268A: Standard for Smoke Detectors for Duct Application
10. ANSI B1.20.1: Standard for Pipe Threads, General Purpose
11. Factory Mutual
12. Requirements of the CSFM
13. Manufacturer's Design, Installation, Operation & Maintenance Manual

B. The complete system shall have the applicable following listings and approvals:
   1. Underwriters Laboratories, Inc.
   2. Factory Mutual Global

1.04 SYSTEM DESIGN CRITERIA

A. All system components shall be manufactured and/or supplied by Kidde Fire Systems, 400 Main Street, Ashland, MA 01721, USA,

B. Only green suppression agents are allowed.

C. The system shall be supplied and installed by a Contractor. The Contractor shall be trained by the manufacturer to design, install, test and maintain the Kidde Novec 1230 System and Aries Netlink Control Unit shall be able to produce certificates stating such on request.

D. All materials and equipment shall be new and unused.

E. A total flooding, clean agent fire suppression system, filled with Novec 1230, shall be installed to meet a minimum design concentration per NFPA requirements and calculations.

1.05 QUALIFICATIONS

A. Manufacturer
   1. The manufacturer/supplier of the system hardware and components shall have a minimum of fifteen (15) years experience in the design and manufacture of systems of similar type
   2. The manufacturer/supplier of the systems shall be certified to ISO 9001 for a minimum period of five (5) years for the design, production and distribution of fire detection, fire alarm and fire suppression systems.
   3. The name of the manufacturer/supplier and manufacturer part numbers shall appear on all major components.
   4. All devices, components and equipment shall be the products of the same manufacturer/supplier.
   5. The system manufacturer/supplier shall have the ability to provide multiple suppression system arrangements to accommodate the performance criteria required by the project.
   6. All devices, components and equipment shall be listed by the standardizing agencies (ULC and/or FM).
   7. The contractor and installer shall be a listed/certified company meeting all the requirements for design and installation per the manufacturer.

B. Contractor
   1. The system shall be supplied and installed by a factory authorized, Kidde Fire Systems distributor. The Contractor shall be trained by the manufacturer to calculate/design, install, test and maintain the fire suppression system and shall be able to produce a certificate stating such on request.
   2. The installing contractor shall employ a person who can show proficiency at least equal to a NICET level IV certification in special hazards design.

3. The Contractor shall confirm in writing that he stocks a full complement of spare parts and offers 24-hour emergency service for all equipment being furnished.

1.06 WARRANTY

A. The manufacturer shall warrant the system from the date of shipment from the factory as follows: Kidde Engineered System products for thirty-six (36) months; Kidde Aries Netlink Control Unit for sixty (60) months; and the SmartOne devices for twenty-four (24) months.

1.07 SUBMITTALS

A. The Engineer will review all submittals for conformance to the drawings and specifications. The contractor shall be required to resubmit any materials, with appropriate modifications, that are found to be in non-conformance with the requirements of the drawings and these specifications after review by the architect. Approval of the submittals by the architect shall not relieve the Contractor of their responsibility to meet the requirements of the drawings and specifications.

B. Engineered Design Drawings: The Contractor shall provide all required documents that shall include the following details:
   1. The contractor shall coordinate with the factory-authorized Kidde Fire Systems Distributor to provide all required installation drawings per 2015 NFPA 2001 as adopted in the 2019 CFC Ch. 80 as a deferred approval submittal.
   2. Plan and riser drawings showing the location of the Kidde Aries Netlink Control Unit and the locations and necessary installation and mounting details of all field devices such as smoke detectors, manual-release stations and notification appliances. Conduit routings shall be shown, with number of conductors, type of wire, and wire sizes indicated for each conduit segment.
   3. Point-to-point wiring diagram showing the termination points for all field-wiring circuits to the internal Kidde Aries Netlink PCB. All internal wiring and communications cabling shall be shown.
   4. A primary-power calculation that details the power requirements for the Kidde Aries Netlink Control Unit and all field devices such as smoke detectors, notification appliances and releasing solenoids. Include the required capacity of the main AC power-line feed from the commercial power and light company.
   5. A secondary power calculation that shows the quiescent and alarm power requirements for the Kidde Aries Netlink Control Unit and all field devices. Include the periods of time for which the quiescent and alarm power requirements shall be supported in order to determine the necessary standby battery capacity.
   6. The contractor shall submit a calculation justifying the capacity of batteries selected.

C. Flow Calculation Reports: The Contractor shall provide the following information in the flow calculation report.
   1. Customer information and project data.
   2. Enclosure information. At a minimum, enclosure information shall include minimum and adjusted design concentrations, minimum and maximum enclosure temperatures, minimum agent required and volume of enclosures, including non-permeable volume if applicable.
   3. Agent information. At a minimum, agent information shall include cylinder size and part number, quantity of cylinders, main and/or reserve cylinders, pipe take off direction and the floor loading for agent cylinder
   4. Pipe network information. At a minimum, pipe network information shall include pipe type, pipe diameter, pipe length, change in direction or elevation, pipe equivalent length and any added accessory equivalent length. In addition, the following nozzle information shall be provided; number of nozzles and identification of enclosure location, flow rate of associated nozzle, nozzle nominal size, nozzle type and nozzle orifice area

D. Pipes and pipe fittings. A detailed list of pipes and pipe fittings used in the design of the pipe network.

E. OPTIONAL: Three-Way Ball Valve Information. A calculation shall be completed for each directional valve in the piping network. Modeling of the Three-Way Ball Valve shall be shown in the ”90-deg” and “through” position.

F. Commissioning Equipment List: The Contractor shall provide a commissioning equipment list for each installed system. The equipment list shall identify all installed equipment and configurations. The Contractor shall submit the following:
   1. Four (4) sets of installation drawings for each installed system and one (1) set of calculation reports, owner’s manuals and product data sheets.
   2. A description of system functionality and a detailed matrix of all the initiating points, control modules, and field circuits that identifies the labeling of all components and shows the relationships and activation sequences among the various initiating points and the control modules and/or field circuits.
   3. The contractor shall submit a commissioning check sheet for each installed ASD detector. The check sheet shall list all installed equipment, configurations and measured ambient conditions
   4. The Contractor shall submit a test plan that describes how the system shall be tested. This shall include a step-by-step description of all tests and shall indicate type and location of test apparatus to be used. Tests shall not be scheduled or conducted until the engineer of record approves the test plan. At a minimum, the tests to be conducted shall be per the relevant referenced codes and any additional supplemental tests required by the CSFM/OSFM. Tests shall not be scheduled or conducted until the engineer of record approves the test plan.
   5. Upon completion of installation and commissioning acceptance, two (2) sets of “As-Built” installation drawings and One (1) set of the calculation report for each installed system.

G. Test Plan
   1. The distributor shall submit a test plan that describes how the system equipment and room integrity shall be tested. This shall include a step-by-step description of all tests and shall indicate type and location of test apparatus to be used. At a minimum, the tests to be conducted shall be per 2015 NFPA 2001 as adopted in the 2019 CFC Ch. 80 and any additional supplemental tests required by the CSFM/OSFM. Tests shall not be scheduled nor conducted until the engineer of record approves the test plan

H. Installation Drawings
   1. Four (4) sets of installation drawings for each installed clean agent fire extinguishing system and one (1) set of the calculation report, owner’s manual and product data sheets shall be submitted to the end-user/owner.
   2. Upon completion of installation and commissioning acceptance, two (2) sets of “As-Built” installation drawings and One (1) set of the calculation report for each installed clean agent fire extinguishing system shall be given to the owner/end-user for use and reference.

I. Documentation: The Contractor shall submit two (2) copies the following after complete installation:
   1. Kidde Fire System Design, Installation, Operation and Maintenance Manual.
   2. Kidde Aries Netlink Installation, Operation and Maintenance Manual.

PART 2 - SUPPRESSION SYSTEM REQUIREMENTS

2.01 GENERAL

A. The clean agent fire extinguishing system shall consist of NOVEC 1230, agent storage container(s), 1800-psig seamless nitrogen cylinders, Kidde actuation hardware and Kidde discharge nozzle(s) attached to a pipe network.

2.02 SYSTEM PERFORMANCE

A. System Discharge
   1. The discharge time required to achieve 95% of the minimum design concentration for flame extinguishment shall not exceed 10 seconds.

B. Duration of Protection
   1. 85% of the minimum design concentration shall be maintained for 10-minutes or a sufficiently longer period of time to allow effective emergency action by trained personnel. A level 1 certification in room integrity testing, provided by a recognized manufacturer of room integrity testing equipment, is required.

C. Minimum System Design Limits
   1. Nozzles
      a. Nozzles shall be listed and approved for a maximum ceiling height of 16 feet (4.88 m) and a minimum ceiling height of 1 foot (0.31 m).
      b. Nozzle area coverage for both 360- and 180-degree nozzles shall be a maximum of 35.6 ft. x 35.6 ft. square (10.85 m x 10.85 m).
      c. System Nozzles shall be listed and approved to accommodate a maximum arrival time of 2.0 seconds and a maximum run-out time of 6.3 seconds.
      d. System Nozzles shall be listed and approved for a minimum of 60.3 PSIG (4.16 bar gauge) nozzle pressure.

2.03 PIPE AND FITTINGS

A. Distribution piping, and fittings, shall be installed in accordance with 2015 NFPA 2001 as adopted in the 2019 CFC Ch. 80, approved piping standards and the engineered fire suppression system manufacturer's requirements.

2.04 ACTUATION HARDWARE

A. The agent cylinders shall be actuated in accordance with the applicable design manual.

B. The suppression panel shall be UL Listed per UL 864, 9th Edition with the interfacing electric actuators.

2.05 NOZZLES

A. Total flooding clean agent extinguishing system nozzles shall be made of stainless steel.

B. Each nozzle shall be located in the space per the manufacturer's guidelines. Nozzles shall have either a 180- or a 360-degree discharge pattern.

C. Each nozzle discharge pattern shall be available in sizes ranging from 3/8-in NPT to 2-in NPT.

D. Within each nozzle size and style, the manufacturer shall offer multiple different orifice areas (minimum of 20).

E. Nozzles shall be UL Listed and FM Approved for use with the manufacturer's clean agent extinguishing system employing Novec 1230 fluid.

2.06 AGENT STORAGE CONTAINER ASSEMBLIES

A. Novec 1230 fluid shall be stored in containers manufactured and marked in accordance with US Department of Transportation (DOT) specification 4BW-500 or 4BA-500. The agent storage containers shall be conditioned to 360 PSIG @ 70°F (24.8 bar gauge @ 21°C). Cylinder and valve assemblies shall be dual marked with Transport Canada (TC) specification 4BW-M34 or 4BA-M34. The system manufacturer shall be able to provide US

DOT documentation that the registration number marked on the agent storage container corresponds to a manufacturing location at a US address.

1. Novec 1230 fluid containers shall be equipped with a pressure gauge to display internal pressures. The gauge shall be an integral part of the equipment and shall be color-coded for fast referencing of pressure readings.
2. A low-pressure switch shall be provided as standard equipment on the Novec 1230 fluid containers. A decrease in pressure will cause the normally open contacts to close, indicating a trouble condition at the control panel. The low-pressure switch shall be field removable/replaceable while the container is still fully charged.
3. Novec 1230 fluid containers with empty weights in excess of 105-lbm shall be equipped with an integral liquid level indicator (LLI). The LLI will allow the agent container to remain connected and secured in place while measuring the agent mass.

2.07 OPTIONAL EQUIPMENT

A. When protecting multiple hazard areas from a single supply of Novec 1230 fluid, Kidde Three-Way Directional Ball Valves shall be used.
   1. The Three-Way Directional Ball Valves shall be UL Listed or FM Approved for use with Novec 1230 fluid and Kidde Engineered Suppression Systems.
   2. The Three-Way Directional Ball Valves shall be installed and located in the piping network per the manufacturer's guidelines and design manual.

2.08 ELECTRICAL WORK

A. All electrical enclosures, raceways, and conduits shall be provided and installed in accordance with applicable codes and intended use, and shall contain only those electrical circuits associated with the fire-detection and control system. No circuit or circuits that are unrelated to the fire alarm or suppression system shall be routed through the enclosures, raceways, and conduits dedicated to the fire alarm or -suppression system.

B. Splicing of circuits shall be kept to a minimum, and is only permitted in an electrical box suitable for the purpose. Appropriate hardware shall be used to make the wire splices. Wires that are spliced together shall have the same color insulation.

C. White colored wire shall be used exclusively for the identification of the neutral conductor of an alternating-current circuit. Green colored wire shall be used exclusively for the identification of the earth-ground conductor of an AC or DC circuit. Appropriate color-coding shall be utilized for all other field wiring.

D. All electrical circuits shall be numerically tagged with suitable markings at each terminal point. All circuits shall correspond with the installation drawings.

2.09 GENERAL

A. Kidde Aries Netlink shall be an addressable, distributed-intelligence type Control Unit.

2.10 SYSTEM CONFIGURATION

A. Activation of the extinguishing system shall be via crossed-zoned smoke detection in the following optional combinations:
   1. SmartOne Photoelectric smoke detector.

B. Detection system layout shall be in accordance with NFPA 72 and it shall require the activation of at least one detector from each of the two crossed-zoned detector groupings to trigger the automatic release of the extinguishing system.

2.11 CONTROL PANEL

A. The control unit shall consist of a printed-circuit board (PCB), an integral display/control assembly, and terminations for all field circuits, a primary power supply and an enclosure with removable door and viewing window.

B. The PCB shall contain the main-system microprocessor, the real-time clock, the history buffers, the watchdog timer, one USB device port, and two RS-232 serial ports. It shall also provide terminations for the following field circuits:
   1. One (1) signaling line circuit (SLC)
   2. Two (2) notification appliance circuits (NACs)
   3. Two (2) combination NAC/releasing circuits (Combos)
   4. Two (2) releasing circuits
   5. Three (3) programmable relays
   6. One (1) trouble relay
   7. One (1) RS-485 communications circuit
   8. Battery charging circuit
   9. AC input power connections

C. The SLC shall serve as the hardware and software interface between the intelligent initiating and control devices and the Kidde Aries Netlink Control Unit. The SLC shall be capable of communicating with up to 255 automatic detectors, monitor modules, and control devices, in any combination, without restrictions on the numbers of each type of field device.

D. The two releasing circuits shall be capable of actuating electro-explosive initiators, control heads, or solenoid valves. Each releasing circuit shall be independently programmable to activate any of the following configurations of extinguishing-system actuators:
   1. Electro-explosive initiators, supervised and activated in series, subject to the constraints below:
      a. Maximum of six (6) P/N 93-002009-004
      b. Maximum of six (6) P/N 93-191001-001
   2. One (1) control head or solenoid valve
   3. Two (2) control heads or solenoid valves supervised in series and activated in parallel. It shall not be necessary to use identical solenoid valves when two valves are activated on one releasing circuit.
   4. The releasing circuits shall be capable of actuating Factory Mutual System classified valves (Groups A, B, D, E, G).

E. The two notification-appliance circuits (NACs) shall be independently programmable and configurable for either Class-A or -B operation.
   1. The input power to the NAC shall be filtered and regulated. The NAC shall be capable of delivering a current of up to 1.5 A @ 24 VDC to the notification appliances.
   2. It shall be possible to field-configure each Class-B, Style-Y NAC to activate notification appliances with any and all of the following parameters via a personal-computer-based configuration program:
      a. Twenty-character location
      b. Drill activation
      c. Silenceable/non-silenceable operation
      d. Walk-test activation
      e. Master-coded operation (60 bpm, 120 bpm, temporal per ANSI S3.41, continuous)
      f. Cutoff delay (5, 10, 15 minutes)
      g. Silence inhibit (1, 3, 5 minutes)
   3. It shall be possible to override one master code with another depending on the state (i.e., prealarm, prerelease, release, or time-limit-cutout) of the particular suppression zone. It shall also be possible to shut off and re-activate a NAC as required by the approved system operating sequence. No supplemental equipment shall be required to perform this functionality.

4. It shall not be necessary to use external synchronization modules to synchronize the audible and visual notification signals created by any NAC
5. Terminals for connection of field conductors to the NACs shall be large enough to accommodate #12 AWG wiring
6. The basic power-supply / charger assembly shall consist of an AC to DC switching power unit. The power-supply / charger assembly shall be configurable to accept either 120 or 240 VAC input voltage, and shall provide 5.4 A at 24 VDC of filtered and regulated power to operate the system and charge the system's standby battery. The charger assembly shall be capable of charging batteries of capacities up to 70 AH. Two user-configurable auxiliary-power circuits shall be provided on the PCB to power peripheral devices. The auxiliary-power circuits shall be software programmable for either continuous or interruptible power output, and shall be rated for 1.0 A at 24 VDC. It shall not be necessary to set jumpers or dip switches on the PCB to make these outputs continuous or interruptible.
7. The system shall have the ability to use an optional Intelligent Communications Module (ICM). The ICM shall be a device server that provides Internet access to the Kidde Netlink Control Unit via any standard Web browser such as Chrome, Fire Fox or Edge. Browser interface shall support HTLM5. The ICM shall provide the following client services:
    a. Dial-up control-unit monitoring and status reporting
    b. Automatic event detection and reporting via e-mail
    c. Web-browser-based
    d. Emulated display for the control unit
    e. Access to items in the control unit's List Menu.

2.12 ANNUNCIATION

A. The following modules shall be provided for remote-event annunciation and operator control as indicated on the bid documents.
    1. Textual-Type Remote Display Control Module (RDCM)
        a. Model RDCM shall completely duplicate the display and operator-intervention capabilities of the main-control-unit display.
        b. The RDCM shall communicate with the Kidde Aries Netlink Control Unit via RS-485 communications, and the system shall be capable of supporting with up to 15 remote displays.
        c. The remote displays shall operate on 24 VDC power provided by the Kidde Aries Netlink power supply, or by any remote power supply that is UL Listed or FM Approved for fire alarm applications. The remote-display modules shall supervise their input-power connections.
        d. The main Kidde Aries Netlink Control Unit display or one RDCM shall be capable of being programmed as the master unit with immediate operator-intervention privileges upon the occurrence of any alarm or fault condition. The master unit shall have control for a minimum period of 30 seconds, and all other control points shall be locked out and notified of the locked-out condition if another operator attempts to intervene during the locked-out period imposed by the master control module.

B. Output Driver Modules
    1. The Model ATM-L Annunciator Driver Module shall provide the Kidde Aries Netlink Control Unit with up to 32 programmable outputs for remote LEDs, along with 6 system-level LEDs and 5 system-level functional switches.
    2. The Model ATM-R Relay Driver Module shall provide the Kidde Aries Netlink Control Unit with up to 32 programmable outputs for remote relays.
    3. The ATM-L and -R Modules shall communicate with the Kidde Aries Netlink Control Unit via the RS-485 communications circuit, with the most-remote module capable of being located up to 4,000 feet from the control unit. The ATM-Ls and ATM-Rs shall be capable of being installed in various combinations as long as the maximum number of 16 for each module type is not exceeded.

4. Both modules shall be powered from the Kidde Aries Netlink power supply, or from an external, regulated, and power-limited power supply Listed and Approved for use with fire-protective-signaling systems, depending upon the total load of the remote outputs.

2.13 DETECTORS

A. Smart One Photoelectric Detector
   1. The SmartOne Photoelectric Detector, Model PSD-7252, shall be a microprocessor-based smoke detector. The photoelectric detector shall be a light scattering type, low profile, intelligent detector that senses a broad range of smoldering and flaming-type fires. The sensing chamber shall permit a full 360° smoke entry.
   2. Each photoelectric detector shall be electronically addressable and fully field-programmable. It shall be possible to set an alert threshold anywhere from 0.2 to 3.4% per foot obscuration in 0.1%-per-foot increments, and to set an alarm threshold anywhere from 0.5 to 3.5% per foot obscuration in 0.1%-per-foot increments. Alarm thresholds shall be dynamically adjustable as a result of another alarm event anywhere in the system. Where permitted, each detector shall be programmable for alarm verification in periods of up to 180 seconds in 1-second increments. Each detector shall provide a real-time value of current, local obscuration level in percent-per-foot readout when requested by an operator at the control unit.
   3. It shall be possible to configure each photoelectric detector for non-latching operation to prevent inadvertent or spurious fire signatures from accidentally discharging a waterless extinguishing system. The control unit shall latch the alarm report, but the discharge sequence shall be interrupted if the fire signature at the detector drops below the detector's programmable alarm threshold
   4. Detector calibration, address, alert and alarm thresholds, and drift-compensation algorithm shall be stored in each detector's non-volatile memory. Systems that store all detector parameters in the control unit (i.e., non-distributed-intelligence-to-the-device-level architecture) shall not be considered as equivalent.
   5. A detector-housing, Model DH-2000, shall be available to allow a photoelectric detector to monitor for the presence of combustion products in an air duct. The detector housing shall be rated for air-duct velocities ranging from 500 to 4,000 feet per minute. It shall also be possible to mount the photoelectric detector in an air duct with velocities ranging up to 4,000 feet per minute.

B. SmartOne Thermal Detector
   1. The SmartOne Thermal Detector, shall be a microprocessor-based heat detector. The thermal detector shall be a thermistor-type, low profile, intelligent detector that responds to a fixed temperature with minimal thermal lag. The sensing chamber shall permit a full 360° heat entry.
   2. Each thermal detector shall be electronically addressable and fully field-programmable. It shall be possible to set both alert and alarm thresholds anywhere from 80°F to 155°F in 1°F increments. Each detector shall provide a real-time value of current, local temperature in °F readout when requested by an operator at the control unit.
   3. It shall be possible to configure each thermal detector for non-latching operation to prevent inadvertent or spurious fire signatures from accidentally discharging a waterless extinguishing system. The control unit shall latch the alarm report, but the discharge sequence shall be interrupted if the fire signature at the detector drops below the detector's programmable alarm threshold.
   4. Detector calibration, address, and alert and alarm thresholds shall be stored in each detector's non-volatile memory. Systems that store all detector parameters in the control unit (i.e., non-distributed-intelligence-to-the-device-level architecture) shall not be considered as equivalent.

2.14 CONDUCTORS AND CONDUITS

A. All conductors shall be enclosed in rigid or thin-walled, steel conduit unless open wiring is permitted by the local electrical code.

B. Any conduit or raceway exposed to dampness or other similar conditions shall be properly sealed and installed to prevent moisture entrapment. Provisions for draining and drying shall be employed as required.

C. All wiring shall be of the proper size to conduct the circuit current, but shall not be smaller than #18 AWG unless permitted by the local electrical code. Wiring for the signaling line circuit shall be in accordance with the Kidde Aries Netlink Installation, Operation, and Maintenance Manual. Wire that has scrapes, nicks, gouges, or crushed insulation shall not be used. The manufacturer's minimum wire-bending radii shall be observed in all enclosures, raceways, and conduits. Aluminum wire shall not be used.

2.15 SUPPRESSION SYSTEM INSTALLATION

A. The system shall be supplied and installed by a factory-authorized, Kidde Fire Systems Contractor. The Contractor shall be trained and certified by Fenwal Protection Systems to design, install and maintain the Kidde fire suppression system. The Contractor shall install the system in accordance with the manufacturer's design, installation, operation and maintenance manual.

2.16 ELECTRICAL SYSTEM INSTALLATION

A. The contractor shall install the system in accordance with the appropriate Fenwal Protection Systems installation, operation and maintenance manual.

B. Locations of all electrical equipment, the Kidde Control Unit, and all system components are subject to the approval of the architect.

C. All final-acceptance tests shall be performed in the presence of the architect and the CSFM/OSFM. The contractor shall record all equipment, tests and system configurations in a format approved by the manufacturer and/or the CSFM/OSFM. A copy of the commissioning tests and results shall be provided to the architect, the CSFM/OSFM, and the end-user.

2.17 ROUTINE MAINTENANCE

A. Routine maintenance on equipment shall be performed as recommended by the manufacturer's installation, operation and maintenance manual. At a minimum the routine maintenance will include the following by a certified Kidde Fire System Distributor:
   1. Visual Check of Pipe network and distribution nozzles per the operation and maintenance manual.
   2. Weight and pressure of the Kidde Engineered System cylinders per the operation and maintenance manual.
   3. Inspect all cylinders and equipment for damage per the operation and maintenance manual.
   4. Pneumatic operation of the Three-Way Directional Ball Valve. Routine maintenance on the suppression system as a whole shall be performed as recommended by NFPA, current edition.

END OF SECTION

SECTION 22 01 00
OPERATION AND MAINTENANCE OF PLUMBING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All levels of 22 00 00

B. Preparations.
   1. Prior to data collection and compilation, prepare and submit in duplicate an outline of the proposed organization and content.
   2. Compilation: Prepare and collect data concurrently with construction progress. Compile per submitted outline.

PART 2 - PRODUCTS

2.01 OPERATION AND MAINTENANCE MANUALS

A. Form of Submittals
   1. Prepare data in form of an instructional manual for use by Owner's personnel.
   2. Cover: Identify each volume with typed or printed title, "OPERATING AND MAINTENANCE INSTRUCTION". List:
      a. Title of Project.
      b. Provide indexed tabs.
      c. Identify of separate structure as applicable.
      d. Identity of general subject matter covered in the manual.
   3. Format:
      a. PDF.
      b. Manufacturer's printed data.

PART 3 - EXECUTION

3.01 OPERATION AND MAINTENANCE DATA

A. General: Record data and operation and maintenance data are complimentary. Submittal items which may be required under both categories may be included only under one submittal if a statement to that effect is included in the other submittal.

B. Quality Assurance
   1. Preparation of data shall be done by personnel.
      a. Trained and experienced in maintenance and operation of described products.
      b. Familiar with requirements of this Section.
      c. Skilled as technical writer to the extent required to communicate essential data.
      d. Skilled as draftsman competent to prepare required drawings.

C. Content of Manual
   1. Neatly typewritten table of contents for each volume, arranged in systematic order.
      a. A list of each product required to be included, indexed to content of the volume.
      b. List, with each product, name, address and telephone number of:
         1) Contractor
         2) Subcontractor or installer (if different than the contractor).
         3) Maintenance contractor, as appropriate.
         4) Identify area of responsibility of each.
         5) Local source of supply for parts and replacement
      c. Identify each product by product name and other identifying symbols as set forth in Contract Documents.
   2. Product Data:

a. Include only those sheets which are pertinent to the specific product.
b. Annotate each sheet to:
1) Clearly identify specific product or part installed.
2) Clearly identify data applicable to installation.
3) Delete references to inapplicable information.

3. Drawings:
a. Supplement product data with drawings as necessary to clearly illustrate.
1) Relations of component parts of equipment and systems.
2) Control and flow diagrams.
b. Coordinate drawings with information in Project Record Documents to assure correct illustration of completed installation
c. Do not use Project Record Documents as maintenance drawings.

4. Written text, as required to supplement product data for the particular installation.
a. Organize in consistent format under separate headings for different procedures.
b. Provide logical sequence of instructions for each procedure.

5. Factory Authorized Start-Up Report.
a. Provide a factory start-up report for each piece of equipment. Contractor start-up reports, unless contractor is a factory authorized representative will not be allowed.

6. Copy of each warranty, bond and service contract issued.
a. Provide information sheet for Owner's personnel, give:
1) Proper procedures in event of failure.
2) Instances which might affect validity of warranties or bonds.

D. Manual for Equipment and Systems:
1. Submit one copy of complete manual in final form in PDF format.
2. Content, for each unit of equipment and system, as appropriate.
a. Description of unit and component parts.
1) Function normal operating characteristics, and limiting conditions
2) Performance curves, engineering data and tests.
3) Complete nomenclature and commercial number of replaceable parts.
b. Operating procedures:
1) Start-up, break-in, routing and normal operating instructions.
2) Regulation, control, stopping, shut-down and emergency instructions.
3) Summer and winter operating instructions.
4) Special operating instructions.
c. Maintenance Procedures:
1) Routing operations.
2) Guide to "trouble-shooting"
3) Disassembly, repair and reassemble.
4) Alignment, adjusting and checking.
d. Servicing and lubrication schedule.
1) List lubricants required.
e. Manufacturer's printed operating and maintenance instructions.
f. Description of sequence of operation by control manufacturer.
g. Original manufacture's parts list, illustrations, assembly drawings and diagrams required for maintenance.
1) Predicted life of parts subject to wear.
2) Items recommended to be stocked as spare parts.
h. As-installed control diagrams by controls manufacturer.
i. Each contractor's coordination drawings:
1) As-installed color-coded piping diagrams.
j. Charts of valve tag numbers, with location and function of each valve.
k. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.
l. Other data as required under pertinent sections of specifications.
3. Content for each electric and electronic system, as appropriate.

a. Description of system and component parts.
    1) Function, normal operating characteristics, and limiting conditions.
    2) Performance curves, engineering data and tests.
    3) Complete nomenclature and commercial number of replaceable parts.
b. Circuit directories of panel boards.
    1) Electric service.
    2) Controls.
    3) Communications
c. As-installed color coded wiring diagrams.
d. Operating procedures.
    1) Routing and normal operating instructions.
    2) Sequences required.
    3) Special operating instructions.
e. Maintenance procedures.
    1) Routine operations.
    2) Guide to “trouble shooting”.
    3) Disassembly, repair and reassembly.
    4) Adjustment and checking.
f. Manufacturer’s printed operating and maintenance instructions.
g. List of original manufacturer’s spare parts, manufacturer’s current prices, and recommended quantities to be maintained in storage.
h. Other data as required under pertinent sections of specifications.
i. Additional requirements for operating and maintenance data: Respective sections of Specifications.

E. Submittal Schedule
1. Submit tow copies of preliminary draft of proposed formats and outlines of contents prior to start of work.
    a. Architect will review draft and return one copy with comments.
2. Submit one copy of complete data in final form fifteen days prior to final inspection or acceptance.
    a. Copy will be returned after final inspection or acceptance, with comments.
3. Submit specified number of copies of approved data in final form 10 days after final inspection or acceptance.

F. Instruction of Owner’s Personnel.
1. Prior to final inspection or acceptance, fully instruct Owner’s designated operating and maintenance personnel in operation, adjustment and maintenance of products, equipment and systems
2. Operating and maintenance manual shall constitute the basis of instruction.
    a. Review contents of manual with personnel in full detail to explain all aspects of operations and maintenance.

END OF SECTION

This page intentionally left blank

SECTION 22 05 00
COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The requirements of the GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS, SPECIAL CONDITIONS and DIVISION 01 GENERAL REQUIREMENTS, apply to the work of this section.

B. This section applies to all Division 22 Plumbing Sections.

1.02 SUMMARY

A. This section includes all plumbing (equipment, fixtures, pipe and fittings, specialties) inside the building(s) and outside the building(s) to the point of connection to site plumbing systems.

B. Provide complete plumbing systems including:
   1. Service connections to existing on-site utilities, and stubs for future connection to equipment provided under the work of this Section or other Sections of the Specifications.
   2. All piping systems for conduction of cold water, heated water, soil, waste, fuel gas, and other fluids or gases as shown or specified for plumbing work.
   3. All valves, piping supports, piping penetration auxiliaries, piping protective coverings, piping, and other piping accessories as shown or specified for plumbing work.
   4. All plumbing equipment and auxiliary items as specified herein or shown on the drawings.
   5. All low voltage wiring for automatic fixtures as required.

C. All chemicals utilized on site as part of coating, sealant, and other products shall not contain any chemical that is listed as part of Proposition 65 known carcinogens that are identified by NTP, IARC, and the USEPA California Proposition 65 chemical repository contractors are not allowed to bring these chemicals on any California Intel site.

1.03 RELATED SECTIONS

A. Division 23 - HVAC

B. Division 26 - Electrical Work

1.04 DRAWINGS AND SPECIFICATIONS

A. For purposes of clearness and legibility, drawings are essentially diagrammatic and, although size and location of equipment are drawn to scale wherever possible, the Contractor shall make use of all data in all the contract documents and shall verify this information at building site.

B. Information presented on Drawings and in the Specifications is based upon latest data available during their preparation. The Drawings and Specifications are for the assistance and guidance of the Contractor and exact locations, distances, levels, etc. will be governed by the structures and the site the contractor shall accept same with this understanding.

C. The drawings indicate required size and points of termination of pipes, and suggest proper routes to conform to structure, avoid obstructions and preserve clearances. However, it is not intended that drawings indicate all necessary offsets, and it shall be the work of the Contractor to make the installation in such a manner as to conform to structure, avoid obstruction, preserve headroom and keep openings and passageways clear.

1.05 DELIVERY, STORAGE AND HANDLING

A. Contractor shall be responsible for delivery, storage, protection and placing of all equipment and materials.

B. Equipment stored and installed at the job site shall be protected from dust, water or other damage. Cover all equipment stored exposed to weather.

1.06 STRUCTURAL REQUIREMENTS

A. Structural members shall not be cut or modified in any manner without specific instructions from the structural engineer.

1.07 CODES AND SAFETY ORDERS

A. All work and materials shall be in full accordance with the latest rules and regulations of the State Fire Marshall; the Safety Orders of the Division of Industrial Safety; the I.S.O. codes; latest edition of California Code of Regulations, 2019 Title 24, Part 6; the 2019 California Plumbing Code, Title 24, Part 5; the 2019 California Mechanical Code, Title 24, Part 4; the 2019 California Building Code, Title 24, Part 2, 2019 NFPA Codes, and other applicable laws and regulations. Nothing in the Drawings or Specifications shall be construed to permit work not conforming to these codes. Drawings and Specifications take precedence when work and materials called for exceed Code requirements.

1.08 INSTALLATION

A. Manufacturer's Instructions:
   1. When specifications require that installation comply with manufacturer's printed instructions, obtain and distribute copies of such instructions to parties involved in the installation.
   2. Perform work in accordance with manufacturer's instructions. Do not omit any preparatory step or installation procedure unless specifically modified or exempted by specifications.
   3. Handle, install, connect, clean, condition and adjust products in strict accordance with such instructions and in conformity with specified requirements.
   4. Should job conditions or specified requirements conflict with manufacturer's instructions, consult with the Architect for further instructions.
   5. Do not proceed with work without clear understanding.

1.09 PERMITS AND FEES

A. Obtain all permits and pay all required fees for permits and/or utility services. Inspections required during the course of construction shall be arranged as required. On completion of the work furnish the owners representative with certificates of inspection.

B. Include in bid all costs for gas service including meter, regulators and service line installed by a gas utility company or a gas utility company approved contractor.

1.10 SITE CONDITIONS

A. Assume all responsibility for damage to adjoining properties; and restore property to its original condition, should damage occur as a result of the work of this section. Contractor shall thoroughly familiarize himself with all site conditions. Should utilities not shown on the drawings be found during excavations, promptly notify the Architect for instructions as to further action. Failure to do so will make the Contractor liable for any and all damage thereto arising from his operations subsequent to discovery of such utilities not shown on plans.

1.11 SUBMITTALS

A. General
1. A submittal schedule shall be issued by the contractor within 15 days of award of the contract. This schedule shall allow for timely review and approval as required by the contract documents.
2. These requirements apply only to substitutions, submittals, and shop drawings.
3. The contractor shall review all submittals prior to submission to the Architect. Submittals not reviewed by the contractor will be returned to the contractor and will not be reviewed.
4. Any deviations from specified requirements shall be clearly indicated in submittals.
5. Any errors in or omissions from submittals and any consequences of these are the responsibility of the Contractor.
6. Partial or incomplete submittals may be rejected as not complying with requirements; the Contractor shall be liable for any resultant consequences.
7. Delayed submittals may be rejected as not complying with requirements. Whether accepted or rejected, delayed submittals will not be considered justification for extension of contract time or similar relief.
8. Submittals not required or permitted by the Specifications but made at the option of the Contractor, will be returned without review unless accompanied with written valid justification.
9. Submittal items improperly included with those of another category (such as a proposed substitution included with shop drawing submittal) are not valid and will be returned without review.
10. Within 35 calendar days after award of the contract, and before fabrications and installation of any material or ordering of any materials, submit for approval one copy in PDF format of complete submittal data on specified and proposed substituted equipment and materials. Submittals shall list all materials proposed identified with drawing symbols and specific data on equipment such as arrangements, performance curves, sizes, capacity, motor locations, and other pertinent data. Check all submittals for conformance to the requirements of the Construction Documents before forwarding to the architect for each item. No consideration will be given to substitutions submitted past 35 day limit. The contractor shall be responsible for all quantities and errors and omissions of submittals. Furnish samples when requested.
11. Equipment and materials specified as part of the specifications and drawings are listed by two manufacturer's names. The first named manufacturer is the basis of design. The second named manufacturer has been determined to be an equivalent in quality or utility. The second named has not been specifically determined to conform to the first named in size, layout, electrical power, voltage, or impacts to building structure. The contractor is bound by all requirements for substitutes, as described below, for all second named manufacturers and equivalent equipment or products.
12. Each reviewed submittal will be marked to indicate review and directions as stated below.
13. Acceptance of a submittal does not relieve the Contractor of responsibility for omissions from the submittal or errors in the submittal.

B. Review
1. Submittals will be reviewed for general acceptability, not necessarily including all details. The engineers review is for general conformance with the design concept of the project and the information given in the contract documents. The contractor is solely responsible for confirming and correlating all quantities and dimensions; selecting fabrication processes and techniques of construction; coordinating the work and performing all work in a safe and satisfactory manner. Corrections of comments made on this submittal during this review do not relieve contractor from compliance with the requirements of the contract documents or with its responsibilities listed herein.
    a. Proposed substitutes will be judged not only for the acceptability of the items themselves, but also how they will be used under the conditions of the particular project.

b. Proposed substitutions will be judged also for compliance with qualifications and conditions stipulated in paragraph 1.13.

2. Each reviewed submittal will be marked to indicate review and directions as stated below.
   a. Acceptance of a substitute does not waive the specified requirements.
   b. Once a substitution is accepted, no revision or re-submittal may be made except for pressing and valid reason and after receipts of approval to do so.

C. Review Directions
1. The notation "No Exceptions Taken" indicates that no further submittal on the particular matter is required and that the Contractor may proceed with normally ensuing action. The notation may be applied to submittals on substitutions, shop drawings, record data, or operation and maintenance data. The submittal has only been reviewed for general conformance with the design concept of the Contract Documents. The contractor is responsible for the dimensions to be confirmed and correlated at the job site; information that pertains solely to the fabrication process or to the means and methods of construction; coordination of the work; and performing all work in a safe and satisfactory manner. This notation does not modify the contractor's duty to comply with the contract documents.
2. The notation "Make Corrections Noted" indicates that no further submittal on the particular matter is required, but the Contractor shall make all changes or corrections noted (but no others) before proceeding with normally ensuing action. The notation may be applied to submittals on substitutions or shop drawings (but usually not record data or operation and maintenance data).
3. The notation "Amend and Resubmit" indicates that the submittal is not accepted and must be revised, resubmitted, and reviewed again. In the case of submittal on substitutions and shop drawings so noted, the Contractor shall not proceed with any normally ensuing action until the resubmittal is reviewed. The notation may be applied to submittals on substitutions, shop drawings, record data, or operation and maintenance data.
4. The notation "Rejected - See Remarks" indicates that the submittal is not accepted and that resubmittal on the same subject matter is not allowed and will not be considered. The notation will be applied normally only to submittals on substitutions (usually not on shop drawings, record data, or operation and maintenance data).
5. The notation "Returned Without Review" indicates that the submittal or item has not been considered officially because it is either not proper, valid, required, or permitted by the Specifications and has no status or effect.

1.12 SHOP DRAWINGS

A. The contractor is responsible for providing all shop drawings as described below so that the design professional has the opportunity to determine if the contractor understands the contract documents. It is not the purpose of shop drawings to assure that the contractor is meeting the requirements of the contract documents. Review and approval of a submittal neither extends nor alters any contractual obligation.

B. Accompany all substituted equipment with shop drawings showing revised piping layouts in order to ascertain that substituted equipment does not adversely affect layout or work. Shop Drawings: The following conditions apply to shop drawings:
1. Shop drawings are not and do not become Contract Documents.
2. Processed shop drawing submittals and any instructions or requirements noted thereon are a part of the work, but they may not be used as a means of increasing the scope of the work.
3. If deviations, discrepancies, or conflicts between shop drawing submittals and the Contract Documents are discovered either prior to or after the submittals are processed, the Contract Document requirements shall govern.

1.13 SUBSTITUTIONS

A. Whenever any equipment, material, or process is indicated or specified by patent of proprietary name and/or name of Manufacturer, in the Specifications and/or on the Drawings, it is understood that such specification is used to facilitate the description of the material and/or process and deemed to be followed by the words "or equal" unless noted "no substitute".

B. Substitute equipment and materials shall be equal in all respects including quality, arrangement, utility, physical size, capacity, and performance to those specified. Approval of substitute material will not relieve the contractor from complying with the requirement of the Drawings and Specifications. The contractor shall be responsible and at his own expense, for any changes caused by proposed substitutions which affect other parts of his own work or the work of other contractors.

C. The submittal of a proposed substitution shall clearly establish the following:
   1. The item can be transported into and installed in the intended space and in the manner shown.
   2. Required connections (electrical, piping, and other) can be properly made and adjoining work can be properly accomplished.
   3. The proposed substitute is similar to and of substance equal to that specified, is suited to the same use as that specified, and will perform the functions required by the design.
   4. Motors for proposed substitute equipment will have the same minimum differential between motor brake horsepower and motor nameplate horsepower as the specified equipment.
   5. All performance requirements shall be at least equal to the specified product or equipment including noise levels, cooling capacity, heating capacity, air flow quantity, etc.

D. By submitting a proposed substitution, the Contractor agrees to the following:
   1. He will assume full responsibility for any and all modifications and necessary alterations arising from the use of the substitute item or material including all cost incurred.
   2. He will assume full responsibility for any delay in the construction schedule resulting from the use of the substitution.
   3. He will prove harmless and indemnify the Owner and the Owner's design consultants from real or alleged damages that may result from the installation, use, or performance of a substitute material or product.

E. The following conditions apply to substitutions:
   1. Submittals of substitutions are not and do not become part of the Contract Documents.
   2. Contractor shall not order, fabricate, use, or install any substitute product or procedure unless he has received acceptance of the substitute from the Engineer.
   3. Should the Contractor install any substitute product in violation of the above he shall remove it and install the specified product at his own expense.
   4. The Contractor shall provide a letter stating that all the above items shall apply to all substituted products and equipment.
   5. Any submittal for substituted equipment or product that does not clearly show that the substituted item is equal shall be marked rejected and no further submittal shall be allowed on the substituted item. Provide in submittal format documentation that the proposed item is exactly as specified in the contract documents.

1.14 GUARANTEE

A. Guarantee all work for one year from date of acceptance, against all defects in material, equipment and workmanship including repair of damage to any part of the premises resulting from leaks or other defects in material, equipment and workmanship. Guarantee shall be on form supplied by the owner's representative.

1.15 RECORD DRAWINGS

A. Indicate on reproducible drawings the actual location of all piping and equipment as the work progresses. Dimension locations of underground service mains and branches. Deliver the drawings to the architect at the completion of the job.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Shop drawings:
   1. Make all drawings to an appropriate scale, large enough to show all pertinent aspects of the item and the method of its connection into the work.
   2. Make each drawing sheet in a reproducible form (such as CAD, REVIT or PDF)

B. Grouping: Combine submittals in logical groupings; for example, submit Shop Drawings grouped by Sections of the Specifications, arranged in the specified sequence.

C. Shop Drawings: PDF format.

D. Content:
   1. Shop drawings may be:
      a. Drawings or diagrams prepared by the Contractor, a supplier, a manufacturer, or other.
      b. Manufacturer's printed brochures, descriptions, charts, instructions, or data sheets.

E. Timing: Submit all shop drawings prior to installation of any items included in submittal.

2.02 CORROSION PROOFING

A. Corrosion Proofing / U.V. Protection: Products which will be installed outdoors, exposed to the weather, exposed to moisture, or other potentially damaging conditions shall be constructed to resist the effects of such exposure.

B. Exterior casings shall have lapped or gasketed joints effectively sealed to prevent intrusion of moisture or other injurious substances.

C. Casings, pipes, or product items shall be constructed of materials which are fully resistant to harmful substances they may normally contact, or (if ferrous) shall be galvanized after fabrication, or shall be fully protected from such substances by paint or other coating in appropriate thickness or number of coats.

D. All bolts, nuts, screws, and washers shall be galvanized unless specified to be plated or unprotected.

E. Any exposed plastic pipe must have a U.V. inhibitor.

2.03 MATERIAL AND EQUIPMENT

A. All material and equipment shall be new, of the type, capacity and quality specified and free from defects. All materials and equipment shall be of the same brand or manufacturer throughout for each class of material or equipment wherever possible.

2.04 ACCESS BOXES

A. For below grade valves and piping devices
   1. Christy Concrete Products Company, Brooks, with galvanized steel checker plate recessed traffic lid flush with rim of box. Lids for boxes located in areas subject to vehicular traffic shall be constructed to withstand H20 live loading as defined by the American Association of State Highway Officials (16,000 pound maximum individual wheel load).
      Service identification shall be conspicuously welded on lid before galvanizing. For gas service, drill twelve 3/8" diameter vent holes through lid before galvanizing. Provide

manufacturer's box extensions to bring box bottom three inches below bottom of valve and box top flush with finish grade.

2. Box sizes (non traffic)

Type Valve	Valve Size	Box No.
Water	2 1/2" and smaller	B-9
Water	3" and 4"	B-16

2.05 ACCESS DOORS

A. Unless specified otherwise by the Architect, provide access doors of the following type:
   1. Concealed hinges, prime coated with rust-inhibitive paint, style of door to suit wall, ceiling, floor or roof construction and fire rating.
      a. Milcor Type M
      b. Milcor Type UFR, fire resistive type Underwriters Laboratory Class B, 1-1/2 hour rating meets UBC, IBCO and BOCA codes for two hour rated walls self-latching with key lock, Elmdor/Stonman Type FR or equal.
   2. Minimum size; 18" by 18".
   3. Wall and ceiling access doors: Furnish as required for access to valves etc.; coordinate size and location to obtain access.
   4. See architectural drawings for further requirements.

2.06 IDENTIFICATION

A. Equipment: Black Phenolic Plates engraved with ½" high white letters. The equipment shall be identified by the equipment schedule tag numbers shown on the plans (ie. GWH-1). Coordinate identification numbers to ensure that the disconnect switches and other electrical/mechanical equipment has consistent identification numbers.

2.07 MISCELLANEOUS EQUIPMENT AND MATERIALS

A. Furnish and install miscellaneous equipment and materials required for the systems described whether or not specifically shown or specified.

PART 3 - EXECUTION

3.01 ACCESSIBILITY

A. Do not install any equipment, valve, control, motor, filter, or any other device requiring maintenance or service in an inaccessible location or position. Install access doors as specified herein to render all such equipment serviceable whether specifically shown on the plans or not. Maintain code clearance to all equipment. Coordinate location of doors with lights, etc., and locate symmetrically with same.

3.02 PREPARATION

A. Observations: Check all project drawings and specifications; report any discrepancies before proceeding with the work and in time to avoid unnecessary rework.

B. Investigation: Examine the areas, conditions, and status of other work contiguous or connecting to the work to be performed; ensure that the time of installation is coordinated with other work.

C. Interruptions of Service: Portions of this work may involve connection to existing work, facilities, or utilities ties and may require interrupting shutdowns of same. Carefully plan, coordinate and execute such work so that any interruptions will be kept to a minimum in time and occurrence.

Submit request for shutdowns and make shutdowns only after receiving written approval from the Owner.

D. Other: Correct any unsatisfactory conditions that may impede proper execution of the work. Ensure that all arrangements, personnel, materials, and tools are appropriate and adequate before proceeding.

3.03 INSTALLATION

A. General:
   1. Material and equipment incorporated in the work shall be used or applied only for the purpose intended or specified.
   2. Install piping and all equipment that requires access with minimum vertical and horizontal clearances required by OSHA for service.
   3. All pipes and all other equipment shall have 2 inches minimum clearance.
   4. Do not proceed with work without clear understanding.

B. Manufacturer's Instructions:
   1. When specifications require that installation comply with manufacturer's printed instructions, obtain and distribute copies of such instructions to parties involved in the installation.
   2. Perform work in accordance with manufacturer's instructions. Do not omit any preparatory step or installation procedure unless specifically modified or exempted by specifications.
   3. Handle, install, connect, clean, condition and adjust products in strict accordance with such instructions and in conformity with specified requirements.
   4. Should job conditions or specified requirements conflict with manufacturer's instructions, consult with the Architect for further instructions.
   5. Do not proceed with work without clear understanding.

3.04 DEMOLITION

A. General
   1. Procedures shall be determined by the contractor.
   2. Demolition work shall not be commenced until all temporary work such as fences, barricades, and any required warning lights and apparatus are furnished and installed and as required by law, regulation, or ordinance, or elsewhere in this specification.
   3. Demolition work shall proceed in such a manner as to minimize the spread of dust and flying particles and to provide safe working conditions for personnel.
   4. Fires and explosives shall not be permitted.

B. Protection
   1. Contractor shall conform to all Federal, State, and local ordinances related to the protection of the public and Contractor’s personnel and the flow of traffic. Provide protection for persons and property throughout the progress of the work.
   2. Existing work damaged by the contractor in the execution of this Contract shall be restored to former condition by the contractor to the satisfaction of the Owner without an increase in the Contract Sum and without an extension of the Contract Time.

C. Disposition of Materials
   1. All materials and equipment not scheduled to be salvaged, including debris and all rejected salvaged materials, shall become the property of the Contractor and shall be disposed of off-site in a legal manner. Location of dump and length of hall shall be the contractor’s responsibility.

3.05 LOCATION OF EQUIPMENT AND PIPING

A. Where job conditions do not permit the installation of piping, etc. in the location shown, it shall be brought to the engineer's attention immediately before fabrication of piping, etc. and the relocation required shall be determined in a joint conference.

B. The contractor will be held responsible for the relocating of any items installed without first obtaining the architect's or engineer's approval. Remove and relocate such items at the contractors expense as so directed by the architect or engineer.

C. Where piping is left exposed within a room, run in vertical or horizontal planes. Maintain uniform spacing between parallel lines and/or adjacent wall, floor or ceiling surfaces.

D. Horizontal runs of plumbing and/or electrical conduit suspended from ceilings shall provide for maximum clearance.

E. Make minor changes in locations of equipment and piping, etc. from locations shown including minor offsets when directed by the engineer, at no additional cost to the owner.

3.06 CARE AND CLEANING

A. Clean and adjust all equipment at completion of installation to provide operating conditions satisfactory to the engineer. Remove broken, damaged or defective parts; repair or replace as directed by engineer. Remove surface material and debris resulting from this work when directed.

3.07 FLASHINGS

A. Furnish and install a waterproof flashing for each pipe or other penetration through roof or wall. Flashings shall be 4 lb. seamless lead flashings Semco 1100 series with counter flashing as detailed, except in metal roofs flashing for pipes through roof shall be furnished by the roofing contractor. Where details are not specifically delineated, submit details for review.

3.08 PAINTING

A. Painting is included under the Painting and Finishing Section. It shall be the responsibility of the Contractor to properly protect all equipment and controls during painting operations and the contractor shall repair and/or replace any item damaged due to painting that was not properly protected.

3.09 ACCESS DOORS

A. Provide access doors to all concealed equipment, valves, controls, etc. Locate doors where shown or to be coordinated and symmetrically located with lights, diffusers, etc. Access doors furnished by the contractor shall be installed by the general contractor.

3.10 RECORD DATA

A. Compilation
   1. Record and collect information concurrently with construction progress and date all entries; make drawing entries within 24 hours after occurrence of change or installation requiring recording. Any concealed work covered before recording data shall be uncovered as directed or as necessary to obtain data.
      a. Record information on drawing prints using an erasable colored pencil (not ink or indelible pencil); describe clearly by note or graphic line as appropriate.
   2. Locate any concealed work adequately to allow future access with reasonable ease and accuracy.

      a. Identify the plan location of all stub outs, pipe lines, etc., which are buried or concealed in the structure, whether installed where shown on the contract drawings or in a

different location; show actual field dimensions from column lines, wall lines, or other permanent reference lines or points.

b. In many cases on the contract drawings, the arrangement of conduits, pipes and similar items is shown schematically rather than as a precise scaled layout. Identify the actual location of these with horizontal and vertical dimensions. If such lines are exposed or readily accessible, omit dimensional identification.

c. When any work is installed of size, dimension, slope, or location different from that shown on the contract drawings, note the deviation on the Project Record set. If the variations are substantial or cannot be shown clearly on the record drawings, make a new drawing and attach to the Record set.

3. On other documents

a. Where changes occur in specifications, clearly indicate same in ink, colored pencil, or rubber stamp.

b. Where installed equipment differs from that specified (e.g., by accepted substitution or change order) note in the specifications and include complete data on same.

3.11 OPERATION AND MAINTENANCE DATA

A. Preparations: Prior to data collection and compilation, prepare and submit in duplicate an outline of the proposed organization and content.

B. Compilation: Prepare and collect data concurrently with construction progress. Compile per submitted outline.

C. See Section 22 01 00 Operation and Maintenance of Plumbing.

END OF SECTION

SECTION 22 05 13
COMMON MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The requirements of the GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS, SPECIAL CONDITIONS and DIVISION 1 GENERAL REQUIREMENTS, apply to the work of this section.

B. All Division 22 Sections.

1.02 SUMMARY

A. Furnish and install all mechanical work shown on the drawings, specified herein, and as required for a complete and functional installation.

B. This section includes materials and methods applicable to the work described in all Division 22 Mechanical Sections. Specific work requirements of individual Mechanical Sections take precedence if in conflict with requirements of this Section.

1.03 RELATED SECTIONS

A. Division 26: Electrical Work

B. Division 23: HVAC

PART 2 - PRODUCTS

2.01 MOTORS AND STARTERS

A. Motors furnished as part of mechanical equipment shall be of size indicated and shall have starting torque sufficient to start and drive equipment load to which they are connected.

B. Electric motors shall be NEMA Premium efficiency, Gould "E 3Plus,", or equal. Provide motors with maximum efficiency and power factor at their normal load operating point.

C. Motor enclosures shall be:

D. Open drip proof for general use.

E. Totally enclosed for wet or exterior use.

F. Explosion-proof for hazardous location use.

G. Electric Motors of ¾ HP rating and over, heavy duty, ball bearing, open (drip-proof), squirrel cage induction type, normal starting torque 60 cycle service, 40o F continuous rating, and shall conform in all respects to the latest applicable standard of NEMA and AIEE. Motors up to ¾ HP rating shall have sleeve or ball bearing. Electric motors which are not housed within equipment they serve, shall be stamped for Quiet-Operation. Motors shall be of an Energy Efficient design meeting C.E.C., Title 24.

H. Motor starters and contactors except those in motor control centers shall be included in the mechanical work.

I. Starters: Starters furnished integral to, or specifically for, mechanical equipment shall be Square D, General Electric, Cutler-Hammer, or equal and shall comply with the following:
   1. Enclosures shall be NEMA Standard to suit location/duty:
      a. Type 1: general purpose.
      b. Type 3: rain tight.
      c. Type 4: watertight.

   d. Type 7&9: explosion proof.
2. Thermal overload protection devices shall be provided as follows:
   a. One for single-phase motors.
   b. Three for three-phase motors.
   c. One for each ungrounded conductor for each winding of multi-wound or multi-speed motors.
3. Starters for motors up to 1/2 HP may be manual type if no interlocking is required; pilot light to indicate ON position is required.
4. Starters for motors up to 30 HP shall be magnetic across-the-line type except as stipulated above.
5. Starters for motors over 30 HP shall be transition-type magnetic-reduced voltage unless specified otherwise. Coordinate the characteristics to ensure adequate starting torque and to limit the starting current to a level compatible to the electrical system and acceptable to the utility company/agency.
6. Magnetic starters shall be provided with:
   a. 120 volt control circuits.
   b. H-O-A switch in cover.
   c. Auxiliary contacts for necessary interlocking.
   d. Integral disconnect switch or circuit breakers for branch circuit, short-circuit and ground-fault protection.
7. Short-circuit interrupting capacity of starters and disconnects shall be adequate for voltage employed and for current to be interrupted. This may require use of high interrupting capacity breakers or current limiting fuses. If fuses are used, provide three spares for each disconnect.
8. Starters shall be compatible with the motor they control.

PART 3 - EXECUTION

3.01 ELECTRICAL REQUIREMENTS

A. Provide working space around electrical equipment in compliance with the applicable Code and all Safety Orders.

B. Coordinate the Mechanical Work with the Electrical Work to comply with the above. Furnish and set in place all motors and duct or pipe installed controls.

C. Location of all new switches shall be verified with the architect or architect before roughing-in. Furnish necessary control diagrams and instruction for the proper installation of the controls.

D. Assume responsibility to insure that all motors are connected with flexible conduit per Division 26 requirements.

E. Assume responsibility for the proper supervision and testing of the controls for sequence of operation.

F. Motors and control equipment shall conform to the Standards of the National Electrical Manufacturers Association.

G. All equipment electrical characteristics shall be as noted on the drawings, or as specified. Verify before ordering any equipment.

H. Before permitting operation of any equipment which is furnished, installed or modified under this contract, review all wiring connections that pertain to mechanical equipment or work, and verify that these connections are correct.

I. Ascertain that the over-load protection devices installed are of the correct type, rating and setting to properly protect this equipment.

J. Where equipment motors are to be electrically interlocked with other equipment for simultaneous operation, utilize mechanical equipment wiring diagrams to coordinate with the electrical systems so that proper wiring of the equipment involved is affected:

END OF SECTION

This page intentionally left blank

SECTION 22 05 23
GENERAL DUTY VALVES FOR PLUMBING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The requirements of the GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS, SPECIAL CONDITIONS and DIVISION 1 GENERAL REQUIREMENTS, apply to the work of this section.

B. All Division 22 Mechanical Sections.

1.02 SUMMARY

A. See Section 22 05 00

1.03 RELATED SECTIONS

A. Division 26: Electrical Work

B. Division 23: HVAC

PART 2 - PRODUCTS

2.01 GENERAL

A. Furnish two tee handle operators for each size to suit all valves which are installed below grade in access boxes and which are not fitted with integral handles; hub end valves shall be used where required.
   1. Valves on systems operating over 100 psi shall be rated for 150 psi or higher as required.

B. Shut-off service, domestic water
   1. Ball Valves:
      a. Sizes 2” and smaller: Nibco T-585-80-LF, 600 psi rated, threaded or sweat ends, full port, teflon seat, quarter turn handle with stops, two piece bronze body and stainless steel ball.
      b. Sizes 2-1/2 to 4”: Nibco T-FP-600A-LF, 400 psi rated, soldered ends, full port, teflon seat, quarter turn handle with stops, two piece bronze body and stainless steel ball.

C. Balancing Valve
   1. 400 psi, 250º F rating, Bell & Gossett Circuit Setter Plus, Lead Free.
      a. Sizes 1/2" to 3": Bell & Gossett Circuit Setter Plus Balancing Valve, and all metal parts of nonferrous copper alloy; positive shut off EPDM no drip seat; hidden memory stop; threaded connections. Valve to have differential pressure read-out ports across valve seat area.

D. Check Valves: Back flow prevention service
   1. Swing check, Class 125 Buna-N Disc, Nibco or equal.
      a. Sizes 2" and smaller: Fig. T-413; bronze body, threaded ends, plug type bonnet.
      b. Size 2-1/2 and larger: Fig.F-968; iron body brass mounted, flanged ends, bolted bonnet.
   2. Non-slam check Type NS, Bell & Gossett, Nibco, or equal.
      a. Size 4" and larger: Rating Fig. W-960; 250 psi rated, wafer or flanged ends.
      b. Cast-iron body, bronze plug, seat and guide bushing, stainless steel helical spring.
      c. Flow area through valve shall exceed cross-sectional area of specified pipe size by no less than 10%.

E. Pressure Reducing Valve
   1. Sizes ½" – 3", Watts Model 223 or equal.
      a. Bronze body, sealed cage, removable disc holder to allow disc replacement. Rated for temperatures up to 160o F. Adjustable pressure range from 25 to 75 psig with 300-psig initial pressure.
      b. Provide with a separate strainer and built in bypass feature.

F. Y-Type, Armstrong
   1. Sizes 2" and smaller: 250 psi bronze body, threaded or soldered ends, threaded screen retainer. monel screen with .045" perforations.
   2. Sizes 2 ½" and larger: 125 psi body, 125 lb. flanged or grooved ends, bolted screen retainer. monel screen with .045" perforations.

2.02 VALVE BOXES

A. Underground valve box shall be "Brooks or "Christy" marked for service.

PART 3 - EXECUTION

3.01 GENERAL

A. Valves shall be full size of line in which installed. Furnish discs suitable for service intended. All valves shall be properly packed and lubricated. Unions shall be placed adjacent to each threaded or soldered valve or equipment connection 2" and smaller. Install flanges at all valves with stems vertical wherever possible. Stems shall not be placed below horizontal.

B. Install unions adjacent to each valve and at final connection to each piece of equipment.

C. All shutoff valves in water lines shall be or ball valves, unless otherwise shown.

D. Valves shall be provided with brass identification tags indicating service controlled. Tags may be omitted on lines exposed in equipment rooms where service is obvious.

END OF SECTION

SECTION 22 05 29
HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The requirements of the GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS, SPECIAL CONDITIONS and DIVISION 1 GENERAL REQUIREMENTS, apply to the work of this section.

B. All Division 23 Mechanical Sections.

1.02 SUMMARY

A. Furnish and install all mechanical work shown on the drawings, specified herein, and as required for a complete and functional installation.

B. This section includes materials and methods applicable to the work described in all Division 23 Mechanical Sections. Specific work requirements of individual Mechanical Sections take precedence if in conflict with requirements of this Section.

1.03 SUBMITTALS

A. Submit proposed alternative methods of attachment for review and approval by the Architect, prior to deviating from the requirements given below.

B. For all seismic bracing systems, submit structural calculations and details prepared and signed by the Contractors licensed engineer which include all resultant forces applied to the building structure. Do not overstress building structure. The maximum allowable loads are as indicated in 3.01 of this specification. The submittal data required does not require an analysis of the building structural numbers and their reaction to the loads of the piping. The submittal data needs to address attachment methods and shall include calculations indicating the forces that are applied to the building structure at the point of attachment. Calculations will be reviewed for compliance with design criteria, not for arithmetic.

1.04 RELATED SECTIONS

A. Division 26: Electrical Work

B. Division 23: HVAC

1.05 DRAWINGS AND SPECIFICATIONS

A. Information presented on Drawings and in the Specifications is based upon latest data available during their preparation. The Drawings and Specifications are for the assistance and guidance of the Contractor and exact locations, distances, levels, etc. will be governed by the structures and the site the contractor shall accept same with this understanding.

PART 2 - PRODUCTS

2.01 HANGERS AND SUPPORTS

A. B-Line, Tolco or equal.

B. Finish: Electro-Chromate or hot dipped galvanized.

C. Trapeze Suspension, for three or more pipes B-Line 1-5/8" width channel or a size suitable for load in accordance with manufacturer's published load ratings. No deflection to exceed 1/180 of a span.

D. Trapeze Supporting Rods: Diameter sufficient to support the load with a safety factor of 5. Anchor rods securely to building structure. See part three for minimum sizes.

E. Pipe Straps: copper coated for copper.

F. Size: For insulated pipe - pipe hangers sized to allow pipe insulation to pass continuously through the hanger.

G. Insulated Pipe Shields: Utilize isolated pipe supports at all insulated pipe hanger locations.

H. Isolators: Trisolator isolators at all hangers and clamps supporting un-insulated piping and tubing and at all points that pipe comes in contact with structure or other pipes.

PART 3 - EXECUTION

3.01 HANGERS AND SUPPORTS

A. General: Support all piping so that it is firmly held in place by approved iron hangers and supports and special hangers as required or as scheduled on the drawings.
   1. Rigidly fasten hose faucets, and similar items at ends of pipe branches to the building construction near point of connection.

B. Hanger Installation: On all insulated pipes, install the hangers on the outside of the pipe covering and not in contact with the pipe. Burning, welding, cutting, or drilling on any structural member may only be done if approved by the structural engineer. No valve or piece of equipment shall be used to support the weight of any pipe. Provide a hanger close to the point of change of direction of pipe run in either horizontal or vertical plane. Place supports and hangers for cast iron soil pipe as close as possible to joints; when hangers or supports do not come within one foot of a branch line fitting, install an additional hanger or support at the fitting. Protect insulation, when pipe is insulated, at each hanger with 180 degree, 18 gauge, 12 inch long G.I. Saddles.

C. Hanger rods with C-clamp type structural attachment shall be equipped with retaining straps.

D. Metallic Pipe Hanger Spacing and Rod Size Schedule:

Type of Pipe	Spacing		
Pipe Size	½” – 2”	2 ½” – 5”	6” – 8”
Steel Pipe	*8' - 0"	10' - 0"	12’ - 0"
Copper Tubing	5’ - 0”	8’ – 0”	10’ – 0”
Cast Iron	Support at 8'- 0" intervals and on each side of and within 12" of joint.		
Rod Size:	3/8”	½”	5/8”

*1/2” gas piping shall be spaced 6’ – 0” maximum

E. Anchor pipe subject to expansion or contraction in a manner permitting strains to be evenly distributed.

F. Methods of attachment and sizes shall conform to NFPA 13 and FM data sheet 2-8.

G. All hangers and fasteners are subject to the approval of the Structural Engineer.

H. Provide beam clamp retaining straps for all pipe supports attached to structural beams.

I. Support fire-protection system piping independent of other piping.

END OF SECTION

SECTION 22 05 48
VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The requirements of the GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS, SPECIAL CONDITIONS and DIVISION 1 GENERAL REQUIREMENTS, apply to the work of this section.

B. All Division 23 Mechanical Sections.

1.02 SUMMARY

A. See 22 05 00

1.03 RELATED SECTIONS

A. Division 26: Electrical Work.

B. Division 23: HVAC.

1.04 SEISMIC RESISTANCE

A. Furnish and install all systems, units, equipment, and parts to meet or exceed current applicable requirements for seismic resistance specified by codes, regulations, or agencies having jurisdiction. Include all supports, anchors, braces and other restraining devices required. All seismic restraints will meet the following site specific seismic design criteria:
   1. Seismic Design: Refer to the structural plans and specifications for requirements.
   2. Seismic restraints are the responsibility of the contractor.

B. Design of seismic bracing shall meet requirements of CBC Chapter 16A.

PART 2 - PRODUCTS

2.01 BRACING SYSTEMS

A. Provide approved types as manufactured by Tolco or B-line.

PART 3 - EXECUTION

3.01 SWAY BRACING

A. Provide seismic sway bracing in accordance with codes or details shown on the plans.

END OF SECTION

This page intentionally left blank

SECTION 22 05 53

IDENTIFICATION FOR PLUMBING PIPIPNG AND EQUIPMENT

PART 1 - GENERAL

1.01 SEE SECTION 23 05 00

PART 2 - PRODUCTS

2.01 IDENTIFICATION

A. Equipment: Black Phenolic Plates engraved with 1/2" high white letters. The equipment shall be identified by the mechanical equipment schedule tag numbers shown on the plans (ie. GWH-1, CP-1).

2.02 PIPE IDENTIFICATION

A. Brady or equal.

B. Maximum spacing for identification shall be 10 feet.

C. Identification shall be provided per the following
   1. At both sides of floor or wall penetrations
   2. Adjacent to all valves and flanges
   3. Adjacent to all changes in direction
   4. To be visible from the point of normal approach

D. Indicate flow direction and type of fluid.

E. Color code shall be as follows:
   1. Domestic Cold Water – Green Background with White Lettering
   2. Domestic Hot Water - Green Background with White Lettering
   3. Domestic Hot Water Return - Yellow Background with Black Lettering

F. Pipe Letter height shall be as follows:

Outside Pipe Diameter Including Insulation	Minimum Length of Label	Minimum Height of Letters
.75” – 1.25”	8”	.5”
1.5” – 2”	8”	.75”
2.5” – 6”	12”	1.25”
8” – 10”	24”	2.5”
Over 10”	32”	3.5”

PART 3 - EXECUTION

3.01 EQUIPMENT IDENTIFICATION

A. Identify all equipment with permanently attached plates.

B. Identify all controls and controllers except thermostats in finished areas.

3.02 IDENTIFICATION APPLICATIONS

A. Piping and Valves
   1. Provide identifications for all valves. Provide tags with lettered inscriptions (not numbered).

END OF SECTION

SECTION 22 07 00
PLUMBING INSULATION GENERAL REQUIREMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The requirements of the GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS, and DIVISION 1 GENERAL REQUIREMENTS, apply to the work of this section.

1.02 SECTION INCLUDES

A. This Section describes insulation materials, methods, and applications for Mechanical Work, Special or specific details, applications, features, or methods may be described in work descriptions Sections or on the drawings.

1.03 RELATED DIVISIONS

A. 22 00 00: Plumbing

B. 23 00 00: HVAC

1.04 REFERENCES

A. Thermal insulation materials shall meet the property requirements of one or more of the following specifications as applicable to the specific product or end use:
   1. American Society for Testing of Materials Specifications:
      a. ASTM C 547, "Standard Specification for Mineral Fiber Pipe Insulation"
      b. ASTM C 585, "Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System)"
      c. ASTM C 1136, "Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation"

1.05 SYSTEM PERFORMANCE

A. Insulation materials furnished should meet the minimum thickness requirements of National Voluntary Consensus Standard 90.1 (Latest edition), "Energy Efficient Design of New Buildings," of the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE).

B. Insulation materials furnished and installed hereunder shall meet the fire hazard requirements of applicable building codes when tested in composite form per one of the following nominally equivalent test methods:
   1. American Society for Testing of Materials ASTM E 84
   2. Underwriters' Laboratories, Inc. UL 723, CAN/ULC-S102-M88
   3. National Fire Protection Association NFPA 255

C. Molded pipe insulation shall be manufactured to meet ASTM C 585 for sizes required in the particular system.

D. Molded fibrous glass pipe insulation shall comply with the requirements of ASTM C 547.

1.06 QUALITY ASSURANCE

A. Qualifications of Installers: only a licensed firm employing installers specifically skilled and experienced in applying insulation to piping shall do Insulation work.

B. Insulation materials and accessories furnished and installed hereunder shall, where required, be accompanied by manufacturers' current submittal or data sheets showing compliance with applicable specifications listed in above.

C. Insulation materials, including all weather and vapor barrier materials, closures, hangers, supports, fitting covers, and other accessories, shall be furnished and installed in strict accordance with project drawings, plans, and specifications.

D. Insulation materials and accessories shall be installed in a workmanlike manner by skilled and experienced workers who are regularly engaged in commercial insulation work.

E. Codes and Standards:
   1. California Code of Regulations - Title 24.
   2. National Fire Protection Association - 90A
   3. Insulation applied to the exterior or interior surface of ducts, and the exterior surface of piping, shall be UL labeled with maximum flame-spread rating of 25 and maximum smoke-developed rating of 50 according to ASTME 84, when tested as a composite installation including insulation, facing materials, and adhesives as normally applied.

1.07 DELIVERY AND STORAGE OF MATERIALS

A. All of the insulation materials and accessories covered by this specification shall be delivered to the job site and stored in a safe, dry place with appropriate labels and/or other product identification.

B. The contractor shall use whatever means are necessary to protect the insulation materials and accessories before, during, and after installation. No insulation material shall be installed that has become damaged in any way.

C. If any insulation material has become wet because of transit or job site exposure to moisture or water, the contractor shall not install such material, and shall remove it from the job site. An exception may be allowed in cases where the contractor is able to demonstrate that wet insulation when fully dried out (either before installation or afterward following exposure to system operating temperatures) will provide installed performance that is equivalent in all respects to new, completely dry insulation. In such cases, consult the insulation manufacturer for technical assistance.

PART 2 - PRODUCTS

2.01 PLUMBING EQUIPMENT INSULATION – SEE 22 07 16

2.02 PLUMBING PIPING INSULATION – SEE 22 07 19

PART 3 - EXECUTION

3.01 APPLICATION/INSTALLATION

A. Use the types and thickness of insulation specified in work description Sections.

B. Apply insulations in accordance with the manufacturer's recommendations and with instructions specified herein or noted on the drawings.

C. Install insulations only after the systems, items, and equipment have been installed and tested, inspected, and accepted. Exceptions: Slip-on piping insulation and equipment insulations installed at the factory.

D. Fit insulation snugly to the item being insulated; butt all joints tightly with no voids, spaces, or thin spots.

E. Seal all joints completely; where sealing tape is used, center the tape over the joint.

F. Except where specified or necessary, do not use staples or fasteners which penetrate vapor barrier jackets or covers on cold systems or equipment; where such penetrating fasteners are used, seal each penetration completely to maintain the vapor barrier integrity. All penetrations of the ASJ and exposed ends of insulation shall be sealed with vapor barrier mastic. Vapor seals at butt joints shall be applied at every fourth pipe section joint and at each fitting to provide isolation of water incursion.

G. Use adhesives, mastics, cements, sealants, and finishes undiluted unless specifically directed otherwise; apply per manufacturer's directions.

H. Install outdoor jacketing or other specified weather proofing or finishing on all insulations outdoors.

I. Install all indoor exposed insulation with extra care and finish neatly.

J. Follow specified methods of installation unless alternative methods are submitted and approved.

3.02 FINISHING

A. Finishes and Protection:
   1. Insure that the exterior finish of all insulation is applied and complete as specified.
   2. Make ready for painting, or painted to match existing including color where specified for paint.
   3. Install all metal jackets or protective sheathing where specified.

B. Repair, Touchup: Properly repair and touchup all dents, rips, tears, or other damage inflicted on jackets or exterior surfaces of insulation. Breaks or punctures in the vapor barrier of external insulation will not be accepted and must be repaired prior to project acceptance.

END OF SECTION

This page intentionally left blank

SECTION 22 07 16
PLUMBING EQUIPMENT INSULATION

PART 1 - GENERAL

1.01 SEE 22 07 00 AND 22 07 19

PART 2 - PRODUCTS

2.01 SEE 22 07 19

PART 3 - EXECUTION

3.01 APPLICATION

A. Equipment/Tanks
   1. Use System IP3 (Elastomeric Foam)
   2. 3/4” thickness for all sizes.

END OF SECTION

This page intentionally left blank

SECTION 22 07 19
PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. A continuous intact vapor barrier is critical for all pipes conveying fluids at temperatures less than 75° F.

B. All insulation material shall have a mold, humidity, and erosion resistant face that has met the requirements of 2019 CMC Standard No. 6-1.

C. Insulation applied to the exterior surface of pipes located in buildings shall have a flame spread of no more than 25 and smoke developed rating of not more than 50.

D. All requirements of Section 22 07 00 apply to this section.

PART 2 - PRODUCTS

2.01 IP-1 RIGID MOLDED SECTIONAL/INDOOR CONCEALED JACKET

A. Regular shape (straight run).
   1. Molded sectional, factory fabricated of heavy density resin bonded fibrous glass, with integral factory applied all service jack of Kraft paper/aluminum foil/glass fiber reinforcement.
   2. Insulation shall have a thermal conductivity k factor of 0.23 at 75° F mean temperature and be suitable for direct application and service on piping having operating surface temperatures of -60° to 450°F.
   3. Jacket shall:
      a. Extend 1-1/2” (minimum) along one edge of longitudinal joint to form a sealing lap, which shall be faced inside with a paper protected pressure sensitive adhesive.
      b. Have a permanence rating of 0.02 perm/in. and a Beach puncture resistance of 50 units;
      c. Have an exterior suitable for painting with latex or water base paint.
   4. All insulation shall have composite (insulation, jacket, tape seal and adhesive used to adhere jacket to the insulation). Fire and Smoke Hazard ratings as tested under procedure ASTM E-84, NFPA 255 and UL 723, not exceeding Flame Spread of 25 and a Smoke Developed of 50. PVC fitting covers and accessories, such as adhesives, mastics, cements and cloth for fittings shall have the same component ratings.
   5. Paper laminate jackets shall be permanently flame and smoke resistant. Chemicals used for treating paper in jacket laminates shall not be water soluble and shall be unaffected by water and humidity.
   6. Fiberglass Schuler-Manville Micro-Lok, or equal.

B. Irregular shape (fittings, flanges, valves, etc.)
   1. Fibrous glass of same density, thickness, and other properties or characteristics as the adjacent regular shape insulation either pre-molded or field forged to fit the item being insulated. The pre-molded insulation shall be provided with weather protection cover.

2.02 IP-2 RIGID MOLDED SECTIONAL/OUTDOOR JACKET

A. Regular shape (straight run).
   1. Molded sectional, factory fabricated of heavy density resin bonded fibrous glass, with integral factory applied all service jacket of Kraft paper/aluminum foil/glass fiber reinforcement.

2. Insulation shall have a thermal conductivity k factor of 0.23 at 75° F mean temperature and be suitable for direct application and service on piping having operating surface temperatures of -60° to 450°F.
3. Jacket:
4. Straight runs: .016” thick smooth sheet aluminum finish.
5. Irregular shapes:
    a. Amerisafe, factory molded aluminum covers, or
    b. Mitered aluminum sheet matching straight run jacketing, or
    c. Weather coating.
    d. Alternative jacketing: Schuler-Manville Type ML, metal jacketing system.
6. All insulation shall have composite (insulation, jacket, tape seal and adhesive used to adhere jacket to the insulation). Fire and Smoke Hazard ratings as tested under procedure ASTM E-84, NFPA 255 and UL 723, not exceeding Flame Spread of 25 and a Smoke Developed of 50. PVC fitting covers and accessories, such as adhesives, mastics, cements and cloth for fittings shall have the same component ratings.
7. Paper laminate jackets shall be permanently flame and smoke resistant. Chemicals used for treating paper in jacket laminates shall not be water soluble and shall be unaffected by water and humidity.
8. Fiberglass Schuler-Manville Micro-Lok, or equal.

B. Irregular shape (fittings, flanges, valves, etc.)
    1. Fibrous glass of same density, thickness, and other properties or characteristics as the adjacent regular shape insulation, either pre-molded or field forged to fit the item being insulated. The pre-molded insulation shall be provided with weather protection cover.

2.03 IP-3 ELASTOMERIC FOAM

A. Insulation shall be Elastomeric Foam Insulation. Insulation should have a maximum service temperature of 210° F, a minimum service temperature of -40°F, and a “K” factor of 028 at 75°F. The flame spread of the insulation shall be 25 or less, and smoke density shall be 50 or less when tested in accordance with ASTM E84.

B. Provide U.V. protective coating for all outdoor applications. Foster 30-64, Armacell WB Coating or K-Flex 374.

C. K-Flex R-180-FS/R-1800-FS, Armacell Armaflex or equal.

2.04 IP-4 CLOSED CELL POLYOLEFIN

A. Closed cell flexible plastic foam insulation should have a “k” factor of 0.27 or less at 75°F and water vapor permeability of .2 perm-inch or less. The manufacturer shall warrant the insulation to be able to be directly buried underground without any protective jacket.

B. Closed Cell Polyolefin in tubular form shall comply with ASTM C-534, UL 94HBF, UBC 42-1 Class I, ASTM E-84 (25/50), NFPA 255 (25/50), UL 723(25/50), FMCSS-302, CAN-ULC-S102.2-M88 (25/50) Flammability Classification, MEA#267-92-M, New York.

C. Provide U.V. protective coating for all outdoor applications.

D. IMCOA Imcolock or equal.

2.05 IP-5 RIGID MOLDED SECTIONAL/INDOOR EXPOSED JACKET

A. Regular shape (straight run)
    1. Molded sectional, factory fabricated of heavy density resin bonded fibrous glass, with integral factory applied all service jacket of Kraft paper/aluminum foil/glass fiber reinforcement.
    2. Insulation shall have a thermal conductivity k factor of 0.23 at 75°F mean temperature and be suitable for direct application and service on piping having operating surface temperatures of -60° to 450°F.

3. Jacket:
    a. Straight runs: PVC fitting covers with vapor barrier.
    b. Irregular shapes:
    c. Zeston, Snap-Form, factory molded PVC covers, or
    d. Mitered aluminum sheet matching straight run jacketing, or
    e. Alternative jacketing: Schuler-Manville Type ML, metal jacketing system.
4. All insulation shall have composite (insulation, jacket, tape seal and adhesive used to adhere jacket to the insulation). Fire and Smoke Hazard ratings as tested under procedure ASTM E-84, NFPA 255 and UL 723, not exceeding Flame Spread of 25 and a Smoke Developed of 50. PVC fitting covers and accessories, such as adhesives, mastics, cements and cloth for fittings shall have the same component ratings.
5. Paper laminate jackets shall be permanently flame and smoke resistant. Chemicals used for treating paper in jacket laminates shall not be water soluble and shall be unaffected by water and humidity.
6. Fiberglass Schuler-Manville Mico-Lok, or equal.

B. Irregular shape (fittings, flanges, valves, etc.)
1. Fibrous glass of same density, thickness, and other properties or characteristics as the adjacent regular shape insulation, either pre-molded or field forged to fit the item being insulated. The pre-molded insulation shall be provided with PVC protection cover.

PART 3 - EXECUTION

3.01 PIPING APPLICATIONS

Note: Where multiple systems are listed, contractor has the option to choose.

A. Condensate (CD) water piping above grade/indoors
1. Use System IP-3. (Elastomeric Foam).
    a. ¾" thickness for all sizes
2. Use System IP-4. (Closed Cell Polyolefin).
    a. ¾" thickness for all sizes
3. Use System IP-1. (Rigid Molded Sectional/Indoor Jacket) with vapor barrier.
    a. ¾" thickness for all sizes

B. Rain Water Leaders and Overflow Drains above grade/indoors:
1. Use System IP-3. (Elastomeric Foam).
    a. 1" thickness for all sizes
2. Use System IP-4. (Closed Cell Polyolefin).
    a. 1" thickness for all sizes
3. Use System IP-1. (Rigid Molded Sectional/Indoor Jacket) with vapor barrier.

C. Domestic cold water (CW) piping above grade/outdoors
1. Use System IP-2. (Rigid Molded Sectional/Outdoor Jacket) with vapor barrier.
    a. 1 ½" thickness for all sizes
    b. All piping shall have heat trace installed to protect from freezing. Coordinate with the electrical installation.

D. Industrial cold water (ICW) piping above grade/outdoors
1. Use System IP-2. (Rigid Molded Sectional/Outdoor Jacket) with vapor barrier.
    a. 1 ½" thickness for all sizes
    b. All piping shall have heat trace installed to protect from freezing. Coordinate with the electrical installation.

E. Domestic tempered water (TW) above grade/indoors
1. Use System IP-1. (Rigid Molded Sectional/Indoor Jacket) with vapor barrier.
    a. For temperatures 105 to 140° F, 1” thickness for pipes smaller than 1" diameter, 1-1/2" thickness for 1" diameter less than 1-1/2” diameter and 1 ½" thickness for 1-1/2" to 3" diameter, use 1-1/2" thick for all larger piping.

F. Domestic hot water (HW) above grade/indoors
   1. Use System IP-1. (Rigid Molded Sectional/Indoor Jacket) with vapor barrier.
      a. For temperatures 105 to 140° F, 1” thickness for pipes smaller than 1" diameter, 1-1/2" thickness for 1" diameter less than 1-1/2” diameter and 1 ½" thickness for 1-1/2" to 3" diameter, use 1-1/2" thick for all larger piping.

3.02 INSTALLATION

A. Unless specifically excluded herein or on the drawings, insulate all parts of hot piping systems, steam piping, and condensate drains including fittings, flanges, valves, and pipe-mounted devices, except do not cover nameplates on devices.

B. Install insulation in removable sections over unions, flanges, and line components or devices requiring periodic maintenance.

C. Install insulation butted tightly to transitions such as insulated pipe shields, insulated pipe sleeves, equipment connections, etc.

D. Install insulation on piping systems so that condensation will not occur. Insulate pipe supports where hanger is directly in contact with pipe up to the point of connection to the building structure. All piping shall be supported in such a manner that neither the insulation nor the vapor/weather barrier is compromised by the hanger or the effects of the hanger. In all cases, hanger spacing shall be such that the circumferential joint may be made outside the hanger. On cold systems, vapor barrier shall be continuous, including material covered by the hanger saddle.

E. Treat equipment face piping as follows:
   1. Where piping is subject to condensation (domestic water systems, rain water leaders, condensate drains) and where installed above grade outdoors (either hot or cold systems) insulate piping completely to the point of equipment connection.
   2. Where not subject to condensation (hot systems) terminate insulation at the outlet side of the equipment shut-off valve, leaving the face piping un-insulated, 24” max, unless noted otherwise, except where exposed to outdoors.

F. Install insulation materials with smooth and even surfaces. Insulate each continuous run of piping with full-length units of insulation, with single cut piece to complete run. Do not use cut pieces or scraps abutting each other. Butt insulation joints firmly to ensure complete, tight fit over all piping surfaces.

G. Maintain the integrity of factory-applied vapor barrier jacketing on all pipe insulation, protecting it against puncture, tears or other damage. All staples used on cold pipe insulation shall be coated with Foster 30-65 or Childers CP-34 vapor barrier coating to maintain vapor barrier integrity.

H. Rigid Molded Sectional/Jacketed:
   1. Comply with applicable general instructions above.
   2. Apply to all hot water and piping (except where specified or noted otherwise) installed above grade indoors and outdoors, concealed or exposed.
   3. Seal all transverse joints (except at PVC fitting jackets) with circumferentially applied 3" (minimum) width tape of same material as the jacket, faced with the same adhesive as the longitudinal lap, or seal with Hardcast 4" wide Type DT490-C mineral impregnated woven fiber tape (synthetic fiber indoors, cotton fiber outdoors) using Hardcast FTA-20 activator/adhesive applied by brush or roller. Seal transverse joints at PVC fittings jackets with color matching PVC tape and vapor barrier mastic adhesive.
   4. Fittings and valves shall be insulated with pre-formed fiberglass fittings, fabricated sections of fiberglass pipe insulation, blanket insulation, or insulating cement. Thickness shall be equal to adjacent pipe insulation. Finish shall be with pre-formed PVC fitting covers or as otherwise specified on contract drawings.

5. Flanges, couplings and valve bonnets shall be covered with an oversized pipe insulation section sized to provide the same insulation thickness as on the main pipe section. An oversized insulation section shall be used to form a collar between the two insulation sections with low-density blanket insulation being used to fill gaps. Jacketing shall match that used on straight pipe sections. Rough-cut ends shall be coated with suitable weather or vapor resistant mastic as dictated by the system location and service.
6. On hot systems where fittings are to be left exposed, insulation ends should be beveled away from bolts for easy access.
7. On cold systems, particular care must be given to vapor sealing the fitting cover or finish to the pipe insulation vapor barrier. All valve stems shall be sealed with caulking to allow free movement of the stem but provide a seal against moisture incursion.
8. Fit insulation terminations with Zeston, Snap Form, end cap jackets, or seal with Hardcast tape as specified above for joints.
9. On all piping (except equipment face piping) installed outdoors, install outdoor jacketing. Install aluminum sheet jacket with all joints turned down at 45º below horizontal; secure in place with non-corroding bands and/or blind rivets (do not puncture vapor barrier insulation jacket). On equipment face piping (including equipment shut-off valve) coat the insulation with ¼" thick Foster 46-50 or Childers CP-10/11 (weatherproofing) mastic reinforced with glass fabric and finished with two (2) coats of aluminum paint.
10. Penetrations
    a. Extend piping insulation without interruption through walls, floors, and similar piping penetrations, except where otherwise specified.

I. Closed Cell Polyolefin:
1. Install pre slit, pre-glued closed cell polyolefin foam pipe insulation as per manufacturer's recommendations. Seal all joints and seams with Fuse-Seal Gun or with Armstrong 520 adhesive or equal in accordance with manufacturer's written instructions. Fabricate fitting covers from polyolefin foam insulation using same procedure.
2. Verify that work of this section may be installed in strict accordance with the original design, all pertinent codes and regulations, and all pertinent portions of the referenced standards.
3. In the event of discrepancy, immediately notify the Architect.
4. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

J. Install insulation in accordance with insulation manufacturer's instructions and as specified.

K. Install faced insulation with facing to occupied room side. Install non-rated facing in contact with unexposed surface of finish materials.

L. Do not install insulation over recessed light fixtures.

M. Trim insulation neatly to fit spaces. Fit insulation into crevices, spaces at outlet boxes and similar penetrations.

N. Maintain continuous foil faced vapor barrier. Provide fire resistive tape at all edges or penetrations of foil faced insulation, including batt ends.

O. Where wall insulation cavity exceeds 8 feet high, provide blocking or other approved support at 8 feet on center.

END OF SECTION

This page intentionally left blank

22 08 00
PLUMBING COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.01 DESCRIPTION

A. The purpose of this section is to specify the Contractor's responsibilities and participation in the commissioning process relative to division 22.

B. Acceptance testing per California Title 24, 2019 Building Energy Efficiency Standards

C. The commissioning process is primarily the responsibility of the Commissioning Authority, with support for start-up, testing, and commissioning the responsibility of the Contractors. The commissioning process does not relieve the Contractor from participation in the process, or diminish the role and obligations to complete all portions of work in a satisfactory and fully operational manner.

D. Work of Division 22 includes:

1. Testing and start-up of the plumbing equipment.
2. Assistance in functional testing to verify equipment/ system performance.
3. Providing qualified personnel to assist in commissioning tests, including seasonal testing.
4. Completion and endorsement of pre-functional test checklists provided by the Commissioning Authority to assure that Division 22 equipment and systems are fully operational and ready for functional testing.
5. Providing equipment, materials, and labor necessary to correct deficiencies found during the commissioning process which fulfill contract and warranty requirements.
6. Providing training for the systems specified in Division 22 with coordination of owner.

1.02 COMMISSIONING SCOPE

A. Fully commission the following equipment and systems

1. Recirculating Pumps
2. Mixing Valves
3. Expansion Tanks
4. Electric Water Heaters
5. Booster Pumps

1.03 RELATED WORK

A. All testing and start-up procedures and documentation requirements specified within Division 22.

B. Section 01 91 00 – General Commissioning Requirements

C. Section 23 08 00 – Mechanical Commissioning

D. Commissioning functional test procedures that require participation of the Contractors.

E. Cooperate with the Commissioning Authority in the following manner:

1. Allow sufficient time before final completion dates so that test and balance and commissioning testing can be accomplished.
2. Provide labor and material to make corrections when required without undue delay.

3. Put all heating, ventilating, and air conditioning systems and equipment into full operation and continue the operation of the same during each working day of commissioning.

PART 2 - PRODUCTS

2.01 TEST EQUIPMENT

A. Standard certified test equipment for commissioning shall be provided by the TAB Contractor.

B. Proprietary test equipment required by the manufacturer, whether specified or not, shall be provided by the manufacturer of the equipment. Manufacturer shall provide the test equipment, demonstrate its use, and assist the Commissioning Authority in the commissioning process.

PART 3 - EXECUTION

3.01 WORK PRIOR TO COMMISSIONING

A. Complete all phases of work so the system can be started, tested, balanced, and otherwise commissioned. Division 22 has primary start-up responsibilities with obligations to complete systems, including all sub-systems so they are functional. This includes the complete installation of all equipment, materials, pipe, duct, wire, insulation, controls, etc., per the contract documents and related directives, clarifications, change orders, etc.

B. The Commissioning Authority will develop a Commissioning Plan. Upon request of the Commissioning Authority, the Contractor shall provide assistance and consultation. The Commissioning Plan will be developed prior to completion of the installation. The Contractor is obligated to assist the Commissioning Authority in preparing the Commissioning Plan by providing all necessary information pertaining to the actual equipment and installation.

C. Specific pre-commissioning responsibilities of Division 22 are as follows:

1. Normal start-up services required to bring each system into a fully operational state. This includes motor rotational check, cleaning, filling, purging, control sequences of operation, leak testing, full-load and part-load performance, etc. The Commissioning Authority will not begin the commissioning process until each system is complete and documented, including normal contractor start-up.
2. The Contractor shall perform pre-functional tests on the equipment and systems as noted in section 01 9100 General Commissioning Requirements.
3. Contractor start-up forms may be substituted for the pre-functional test forms with prior approval by the Commissioning Authority.
4. Pre-functional test forms will be kept in the Contractors job trailer in a Commissioning Field Notebook provided by the Commissioning Authority.
5. Testing, Adjusting and Balancing shall be completed for all air and hydronic systems, including spot checks, with discrepancies and problems remedied before functional testing begins.
6. Factory start-up services will be provided for key equipment and systems specified in Division 22. The Contractor shall coordinate this work with the manufacturer and the Commissioning Authority.
    a. Functional testing is intended to begin upon completion of a system. Commissioning may proceed prior to the completion of systems and/or sub-systems, if expediting this work is in the best interests of the Owner. Commissioning activities and schedule will be coordinated with the Contractor. Start of commissioning before system completion will not relieve the Contractor from completing those systems as per the schedule.

D. The Field Commissioning Notebook will be used to identify and track all pertinent commissioning documentation required during the Installation phase. This Notebook will be assembled by the Commissioning Authority and maintained by the Contractor. The Notebook provides a central location for the Commissioning Authority to identify, copy and organize all pertinent information and will include the following format:

1. Summary describing Notebook contents and use.
2. Copy of Commissioning Plan for contractor field reference.
3. Listing of all specification documentation requirements listed by specification section, with sign off spots for appropriate contractors.
4. Tabs for each specification section with copies of pre-functional test check sheets provided by coordination of subcontractors and Commissioning Authority for contractor completion and space for related contractor-supplied documents.
5. Prior to functional testing the Commissioning Authority will use this book to verify that all appropriate contractors have completed their work and signed off that they have done so. Once the Commissioning Authority is satisfied that all components of a system are complete functional testing will begin.

3.02 PARTICIPATION IN COMMISSIONING

A. Provide skilled technicians to start up and debug all systems within the division of work. These same technicians shall be made available to assist the Commissioning Authority in completing the commissioning program as it relates to each system and their technical specialty. Work schedules, time required for testing, etc., will be requested by the Commissioning Authority and coordinated by the Contractor. Contractor will ensure the qualified technician(s) are available and present during the agreed-upon schedules and of sufficient duration to complete the necessary tests, adjustments, and/or problem resolutions.

B. The Commissioning Authority reserves the right to judge the appropriateness and qualifications of the technicians relative to each item of equipment, system, and/or sub-system. Qualifications of technicians include expert knowledge relative to the specific equipment involved, adequate documentation and tools to service/commission the equipment, and an attitude/willingness to work with the Commissioning Authority to get the job done. A liaison or intermediary between the Commissioning Authority and qualified factory representatives does not constitute the availability of a qualified technician for purposes of this work.

3.03 WORK TO RESOLVE DEFICIENCIES

A. Maladjustments, misapplied equipment, and/or deficient performance under varying loads will result in a system that does not meet the original design intent. Correction of work will be completed under the direction of the Architect, with input from the Contractor, equipment supplier, and Commissioning Authority. Whereas all members will have input and the opportunity to discuss, debate, and work out problems, the Architect/Engineer of Record will have final jurisdiction on the necessary work to be done to achieve performance and or design intent.

3.04 ADDITIONAL COMMISSIONING

A. Additional commissioning activities may be required after system adjustments, replacements, etc., are completed. The Contractor, suppliers, and Commissioning Authority shall include a reasonable reserve to complete this work as part of their standard contractual obligations.

3.05 SEASONAL COMMISSIONING AND OCCUPANCY VARIATIONS

A. Seasonal commissioning pertains to testing under full-load conditions during peak heating and peak cooling seasons, as well as part-load conditions in the spring and fall. Initial

commissioning will be done as soon as contract work is completed regardless of season. Subsequent commissioning may be undertaken at any time thereafter to ascertain adequate performance during the different seasons.

B. All equipment and systems will be tested and commissioned in a peak season to observe full-load performance. Heating equipment will be tested during winter design extremes. Cooling equipment will be tested during summer design extremes, with a fully occupied building. The Contractor will be responsible to participate in the initial and the alternate peak season test of the systems required to demonstrate performance.

C. Subsequent commissioning may be required under conditions of minimum and/or maximum occupancy or use. All equipment and systems affected by occupancy variations will be tested and commissioned at the minimum and peak loads to observe system performance. The Contractor will be responsible to participate in the occupancy sensitive testing of systems to provide verification of adequate performance.

3.06 TRAINING

A. The Contractor will be required to participate in the training of the Owner's engineering and maintenance staff for each plumbing system and the related components. Training may be conducted in a classroom setting, with system and component documentation, and suitable classroom training aids, or in the field with the specific equipment. The type of training will be per the Owner's option.

B. Training will be conducted jointly with the equipment vendors, the Contractor and Owner’s operations and maintenance representatives. The Contractor will be responsible for the generic training, as well as instructing the Owner's staff on the system peculiarities specific to this project.

C. Prior to the start of training (one month before) the Owner’s operations and maintenance representatives shall be provided with a copy of all equipment Operations and Maintenance manuals no less than (1) prior to the training session of that equipment.

D. The contractor shall provide a walk-through training session with the City Maintenance staff. The walk-through shall be a minimum of 4 hours.

3.07 SYSTEMS DOCUMENTATION

A. Contract Documents to incorporate field changes and revisions to system designs to account for actual constructed configurations will be addressed as required in Division 1. All drawings should be red-lined on two sets. Division 22 as-built drawings should include updated architectural floor plans, and the individual plumbing systems in relation to actual building layout.

1. Maintain as-built red-lines on the job site as required in Division 1.
2. In addition to the stated requirements for operation and maintenance data, provide one copy of equipment technical literature, operation and maintenance literature, and shop drawings to the Commissioning Authority as soon as they are available. This requirement is for review of these documents prior to distribution of multiple copies for the Owner's final use.

END OF SECTION

SECTION 22 11 00
FACILITY WATER DISTRIBUTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The requirements of the GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS, SPECIAL CONDITIONS and DIVISION 1 GENERAL REQUIREMENTS, apply to the work of this section.

B. Section 22 05 00applies to this section.

1.02 SUMMARY

A. This section includes all plumbing (equipment, fixtures, pipe and fittings, specialties) inside the building(s) and outside the building(s) to the point of connection to site plumbing systems.

B. Provide complete plumbing systems including:
   1. Service connections to existing on-site utilities, and stubs for future connection to equipment provided under the work of this Section or other Sections of the Specifications.
   2. All piping systems for conduction of cold water and heated water as shown or specified for plumbing work.
   3. All valves, piping supports, piping penetration auxiliaries, piping protective coverings, piping, and other piping accessories as shown or specified for plumbing work.
   4. All plumbing equipment and auxiliary items as specified herein or shown on the drawings.

1.03 RELATED SECTIONS

A. Section 02 41 13 – Selective Site Demolition: Restoration of Paving and Site Improvements

B. Section 22 05 00 – Plumbing

C. Section 22 07 00 – Insulation

D. Section 21 00 00 – Fire Protection

E. Section 23 00 00 – Heating, Ventilating, & Air Conditioning

1.04 STRUCTURAL REQUIREMENTS

A. Structural members shall not be cut or modified in any manner without specific instructions from the structural engineer. Where possible, offset vents and pipes rising in walls, concealed above ceilings, below plates and rise through roof. Where this is not possible, install vents and pipes through plates as detailed on structural drawings.

1.05 SUBMITTALS

A. Submit a general statement of materials and methods along with manufacturer’s technical data and installation instructions for all equipment, fixtures, pipe and fittings, and plumbing specialties to be installed.

B. Record Drawings: Per specification section 22 05 00 requirements.
   1. Operation and Maintenance Manuals: Per specification section 22 01 00 requirements.

PART 2 - PRODUCTS

2.01 GENERAL

A. Adapters: Wrought copper male adapters shall be used wherever it is necessary to connect copper tubing to a valve or "tee" having threaded connections

2.02 PIPE PROTECTION

A. Bare copper pipe buried in the ground shall have a corrosion protective wrap of one of the following:
   1. Polyvinyl Chloride Tape: The tape shall be of a minimum thickness of 10 mils and shall be laminated with a suitable adhesive, or shall be applied with a suitable primer adhesive. Width as recommended by the manufacturer for the pipe sizes being wrapped (4" minimum). Tape shall have continuous identification
   2. 3M X-Tru-Coat, factory-applied plastic coating with additional field-applied double-layer wrapping of Scotchrap #51, 20-mil plastic tape, Trentex No. V-10, B-20, Scotchwrap No. 50 Polyvinyl chloride tape wrap, or thermofit sleeves.
   3. Field Joint Cover: Tape coat, prime coat and one layer of Tape coat #20 heat-applied 62-mil tape.

PART 3 - EXECUTION

3.01 MINIMUM COVER

A. Provide trenching and backfill for buried piping and install at the following depth unless shown otherwise, cover is from top of pipe to finish grade.

B. Water - 30" or what is shown on the plans.

3.02 INSTALLATION OF PIPING SYSTEMS

A. General:
   1. Install exposed polished or enameled connections from fixtures or equipment with special care, showing no tool marks or threads at fittings. Inspect each piece of pipe and each fitting carefully for defective workmanship on pipe, or obstruction in pipes and fittings.
   2. Anchor pipe subject to expansion or contraction in a manner permitting strains to be evenly distributed and alleviated by swing joints or expansion loops which shall be installed as required and/or shown. Underground anchors shall consist of plates welded to pipe and encased in concrete. Anchor all domestic cold water piping at all toilet areas that have flush valve urinals or toilets.

B. Thrust Blocks: Provide concrete anchors or thrust blocks for all non-metallic water mains in the ground. Install at all changes in direction and at branch take-offs 2" and larger. Form Thrust Blocks by pouring concrete between the pipes and trench wall. They shall be adequate in size and placed to take all thrusts created by the maximum internal water pressure, as recommended by manufacturer.

C. Sleeves: Install sleeves of sufficient size to allow for free motion of pipe. Finish sleeves flush when in walls and extend a minimum of 2" above floor when passing through floor slabs and outside walls shall be caulked with oakum and mastic and made watertight. No visible leakage at sleeves will be permitted. Sleeves may be omitted for waste lines through slabs on grade and rising into a concealed space if wrapped with 1" insulation. Sleeve all pipes where pipes pass through footings with PVC pipe sleeves.

D. Fire-Barrier Penetrations: Seal pipe penetrations with fire-stopping sealant material specified in Division 7.

E. Cathodic Protection: Install insulated flanges or dielectric unions at points of connection between pipes and equipment as follows: (1) between copper or brass piping and steel or cast iron pipe. (2) Between copper or brass piping and any steel material. (3) Buried connections of copper or brass piping to steel or cast iron piping shall be protected with a polyvinyl tape wrap 10 mils thick, extending 5' each way from connection.

F. Expansion: Install piping with sufficient offsets, loops, and/or swing joints to allow for expansion and contraction. Anchor piping at equipment to restrain movement at those locations.

G. Freeze Protection: Piping shall not be installed in a location subject to freezing conditions. All piping shall and must be installed on the “warm” side of building envelope insulation without exception. Where risers occur in outside walls, ensure that building insulation is adequate and intact. All piping must be drainable. Provide drains required and all piping shall be run in or above heated portion of the building.

3.03 INSTALLATION OF UNDERGROUND PIPE PROTECTION

A. Apply covering to within four inches of ends for each pipe length on pre-wrapped pipe.

B. Clean all piping of all loose scale, rust, dirt, oil and grease before wrapping. Wire brush as required, use of a quality solvent for removal of oil and grease.

C. Field Joints and Fittings: Joints shall be wrapped to provide at least two full thickness’ over the joint and to extend a minimum of 4" over the adjacent pipe covering. Tightly apply the tapes with a one-half minimum uniform lap, free from wrinkles and voids. Experienced operators shall wrap sections of piping to be wrapped that exceed 50’ of continuous lengths with an approved wrapping machine.

D. Piping Protective Covering Testing. After applying covering, and before back filling. Test all protective covering using a Tinker and Rasor Holiday Detector, obtain certification upon completion of test. Correct any discovered faults in coating and repeat test until system is proved free of all faults.

E. Inspection: Damaged or defective wraps shall be repaired as directed. Do not cover wrapped pipe until the inspection and necessary repairs have been completed and approved by the Architect.

F. Defect Repair: Tape coat TC Cold prime and double wrap of Tape coat CT cold-applied tape spirally wrapped with half-tape width overlap of preceding layer.

G. Covering: Place all backfill carefully in order not to damage the wrap. No rocks or sharp edges shall be back filled against the wrap.

3.04 EXCAVATING AND TRENCHING

A. Perform all excavations as required for the installation of the work included under this section, including shoring of earth banks to prevent cave-ins and to protect workmen and equipment. Restore all surfaces, roadways, walks, curb, walls, existing underground installations, etc. damaged or cut as a result of the excavations to their original conditions in a manner approved by the architect. Excavations shall be ample in size to permit pipes or equipment to be laid at elevations intended, and to permit ample space for caulking and joining and compacting backfill around pipe. Maintain all warning signs, barricades, flares and red signal lanterns as required by the Safety Orders of the Division of Industrial Safety and local ordinances. Perform all pumping required to remove all water from trenches during installation of piping and backfilling.

B. Stop machine excavation for pipe trenches in solid ground, several inches above required grade, so that a firm and uniform bearing throughout entire length of pipe is provided. In lieu of above hand excavation on bottom of trench, the contractor may excavate to a depth one quarter of the nominal diameter of pipe, but in no case excavate less than 6" below required grade line, and place a bed of sand or granular soil, properly compacted to provide a uniform grade and to provide a firm support for pipe throughout its entire length. When pipe or underground conduit with insulation or protective coating is to be placed in the trench, clean sand only shall be used for bedding the pipe or conduit.

3.05 BACKFILLING

A. No backfilling operations shall begin until the required tests and inspections have been made and the Architect has given approval for backfilling. Should any of the work be enclosed or covered up before it has been approved, contractor shall, at his expenses, uncover the work. After it has been inspected, tested and approved, he shall make all repairs necessary to restore the work of the other contractor to the condition in which it was found at the time of uncovering. Insulated pipe and pipe with protective coating shall be backfilled with clean, concrete grade sand for a minimum distance of 12" above the top of the pipe. Compact sand backfill by flooding or jetting. Protect pipe from uplift during jetting operation.

B. Except under existing paved areas, walks, roads, or similar surfaces, and in cases where rock is encountered, backfill more than 12" above the top of the pipe shall be made using suitable excavated material or other approved material as necessary. The backfill shall be placed in 6" layers, measured before compaction, and tamped either by hand or machine.

3.06 CROSSING EXISTING UTILITIES

A. Extreme care shall be exercised during excavation across existing utility lines particularly gas and electrical lines for trenching to install new utility lines. Hand excavate all trenches in the proximity of existing lines so as not to damage or cut into them.

B. All existing utility and service lines shall be located by hand excavation prior to trenching with equipment.

C. The location, depth and invert elevations of all existing utilities to be crossed or to which connecting shall be determined before performing any other work or ordering any materials for the project.

3.07 PROTECTION FROM DAMAGE

A. Protect adjacent work and materials as well as the Mechanical work and material from damage during construction. Cap and/or plug all piping at the completion of roughing-in and before backfilling. Cap all piping at the close of each day.

3.08 FINAL CONNECTIONS

A. Contractor shall verify location of and make all final connections to site utilities, extend to buildings and furnish and install valves, valve boxes, pressure reducing valves, shut-off cocks, cleanouts, pressure regulating valves, adapters and other accessories shown and/or required to connect.

3.09 RESTORATION OF EXISTING IMPROVEMENTS

A. Selective site demolition to provide all new utilities and utility connections, including all existing improvement removal; and all improvement restoration work.

B. Utility paths are shown diagrammatically on Plans, and it is the Contractor’s responsibility to determine the actual routes.

3.10 FIELD QUALITY CONTROL

A. Water Sterilization
   1. Contractor shall provide all ports, valves and isolation of new piping for testing.
   2. After installation and before installing valves or making final connections, flush or purge piping systems clean of foreign substances; use water to flush piping conducting liquids and compressed air to clear piping conducting gases.
   3. After completing cold and heated water systems, disinfect in accordance with current requirements of U.S. Public Health Department. Use 50 parts per million of chlorine with 8 hour retention and flush to leave a residual no greater than supply source. Submit written

certification of disinfecting completion by independent laboratory. After sterilization take at least one (1) water sample per floor and have analyzed for "E-coli" to submit test results.

END OF SECTION

This page intentionally left blank

SECTION 22 11 16
DOMESTIC WATER PIPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The requirements of the GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS, SPECIAL CONDITIONS and DIVISION 1 GENERAL REQUIREMENTS, apply to the work of this section.

B. Section 22 11 00, Facility Water Distribution applies to this section.

1.02 SUMMARY

A. This section includes all plumbing (equipment, fixtures, pipe and fittings, specialties) inside the building(s) and outside the building(s) to the point of connection to site plumbing systems.

B. Provide complete plumbing systems including:
   1. Service connections to existing on-site utilities, and stubs for future connection to equipment provided under the work of this Section or other Sections of the Specifications.
   2. All piping systems for conduction of cold water, heated water, soil, waste, fuel gas, and other fluids or gases as shown or specified for plumbing work.
   3. All valves, piping supports, piping penetration auxiliaries, piping protective coverings, piping, and other piping accessories as shown or specified for plumbing work.
   4. All plumbing equipment and auxiliary items as specified herein or shown on the drawings.

1.03 RELATED SECTIONS

A. Section 22 05 00 - Plumbing

B. Section 22 07 00 - Insulation

C. Section 21 00 00 - Fire Protection

D. Section 23 00 00 - Heating, Ventilating, & Air Conditioning

1.04 QUALITY ASSURANCE

A. All plumbing fixtures and equipment shall comply with California Code of Regulations, Title 24, Part 6, latest edition.

1.05 REFERENCES

A. Pipes and Tubes
   1. Hard Copper Tube: ASTM B88, Types K, L and M, water tube, drawn temper.
   2. Soft Copper Tube: ASTM B88, Types K and L, water tube, annealed temper.

B. Fittings
   1. Wrought-Copper, Solder-Joint Pressure Fittings: ANSI B16.22.
   2. Cast-Copper-Alloy, Solder-Joint Pressure Fittings: ASME B16.18, ASTM B584.
   3. Cast-Copper-Alloy, Threaded -Joint Pressure Fittings: ANSI/ASME B16.15, ASTM B584.
   4. Bronze Flanges: ASME B16.24, Classes 150 and 300.
   5. Copper Unions: ASME B16.18, cast-copper-alloy body, hexagonal stock, with ball-and-socket joint, metal-to-metal seating surfaces, and solder-joint, threaded, or solder-joint and threaded ends. Threads complying with ASME B1.20.1.

C. Joining Materials
   1. Solder Filler Metal: ASTM B32, alloys to suit system requirements.
   2. Brazing Filler Metals: AWS A5.8, alloys to suit system requirements.

1.06 STRUCTURAL REQUIREMENTS

A. Structural members shall not be cut or modified in any manner without specific instructions from the structural engineer. Where possible, offset vents and pipes rising in walls, concealed above ceilings, below plates and rise through roof. Where this is not possible, install vents and pipes through plates as detailed on structural drawings.

1.07 SUBMITTALS

A. Submit a general statement of materials and methods along with manufacturer's technical data and installation instructions for all equipment, fixtures, pipe and fittings, and plumbing specialties to be installed.

B. Record Drawings: Per specification section 22 05 00 requirements.

C. Operation and Maintenance Manuals: Per specification section 22 01 00 requirements.

PART 2 - PRODUCTS

2.01 GENERAL

A. Adapters: Wrought copper male adapters shall be used wherever it is necessary to connect copper tubing to a valve or "tee" having threaded connections.

2.02 PIPE, FITTING, AND JOINING MATERIALS

A. Copper Water Pipe **(See Section 2.03 for Pipe Material to be used for service)**
   1. Pipe: Above grade, Type M, L, or K hard drawn copper tubing per ASTM B-88, plain ends.
   2. Fittings: Solder type, wrought copper per ANSI Standard B16.22 or cast red bronze per ANSI Standard B16.18. Do not use T-drill.
   3. Unions: Solder type, cast red bronze.
   4. Joining Materials/Methods
      a. Canfield, Silvabrite or equal lead free solder with a non-corrosive water based flux.
      b. 15% silver brazing alloy, water based silver brazing flux. Silver content must be clearly identified on the brazing rod.
   5. Connections
      a. Copper to dissimilar metals: dielectric connector.
      b. Copper to threaded connections: cast brass adapters.

2.03 PIPE AND FITTING APPLICATIONS

A. Inside Building (to 5'-0" outside building line).
   1. Water Piping: Above grade, Type L drawn temper, joining methods, soldered connections, below grade, Type K drawn temper copper tubing, joining methods, brazed connections.
   2. Plastic pipe and fittings shall not be used inside of buildings.

B. Outside Building (from 5'-0" outside building line)
   1. Domestic Water
      a. 1 ½" and smaller, Schedule 40 PVC, solvent welded, pipe and Schedule 80 fittings.
      b. 2" & 2 ½", Schedule 80 PVC, solvent welded, pipe and Schedule 80 fittings.
      c. 3" and larger, Johns Mansville, C-900, Blue Brut, PVC pipe and fittings, Class 200, installed in strict accordance with manufacturer's published instructions.

PART 3 - EXECUTION

3.01 PIPING

A. Provide trenching and backfill for buried piping and install with the following minimum cover unless shown otherwise, cover is from top of pipe to finish grade.

1. Water - 30" or what is shown on the plans.

B. Water piping
   1. On buried lines larger than 2 ½" size, install concrete thrust blocks between pipe and undisturbed soil of trench wall at each change in direction (tees and ells) for lateral support.
   2. Where laid in same trench with sewer line, install on trench shelf at least 12" above top of sewer pipe.
   3. Where subject to freezing conditions water pipe shall be buried at least 30 inches deep or deeper to protect the water from freezing.
   4. Run water piping generally level. No piping shall be installed to cause an unusual noise from the flow of water under normal conditions.
   5. All water branches as single fixtures shall be provided with air chambers at least 12" long and of the same diameter pipe as the branches. Where two or more fixtures are located in a row or battery, the supply heads shall be continued full-size of the branch outlet and an air chamber same pipe size as the header and a minimum of 24" long shall be installed on the end of the header.
   6. Adapters: Wrought copper male adapters shall be used wherever it is necessary to connect copper tubing to a valve or tee having threaded connections.
   7. Install Bare Metal Pipe Isolators: Stoneman "Trisolator", Superstrut "Cush-a-strip", Unistrut on all hot and cold domestic water piping.

3.02 FIELD QUALITY CONTROL

A. Water Sterilization
   1. Contractor shall provide all ports, valves and isolation of new piping for testing.
   2. After installation and before installing valves or making final connections, flush or purge piping systems clean of foreign substances; use water to flush piping conducting liquids and compressed air to clear piping conducting gases.
   3. After completing cold and heated water systems, disinfect in accordance with current requirements of U.S. Public Health Department. Use 50 parts per million of chlorine with 8 hour retention and flush to leave a residual no greater than supply source. Submit written certification of disinfecting completion by independent laboratory. After sterilization take at least one (1) water sample per floor and have analyzed for "E-coli" to submit test results.

3.03 PIPING TESTING: TESTING CRITERIA

System	Medium	Pressure	Duration
Water	Water	150 psig	4 hours

END OF SECTION

SECTION 22 11 19
DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The requirements of the GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS, SPECIAL CONDITIONS and DIVISION 1 GENERAL REQUIREMENTS, apply to the work of this section.

B. Section 22 05 00 applies to this section.

1.02 SUMMARY

A. This section includes all plumbing (equipment, fixtures, pipe and fittings, specialties) inside the building(s) and outside the building(s) to the point of connection to site plumbing systems.

B. Provide complete plumbing systems including:
   1. Service connections to existing on-site utilities, and stubs for future connection to equipment provided under the work of this Section or other Sections of the Specifications.
   2. All piping systems for conduction of water as shown or specified for plumbing work.
   3. All valves, piping supports, piping penetration auxiliaries, piping protective coverings, piping, and other piping accessories as shown or specified for plumbing work.
   4. All plumbing equipment and auxiliary items as specified herein or shown on the drawings.

1.03 RELATED SECTIONS

A. Section 22 05 00 - Plumbing

B. Section 22 07 00 - Insulation

C. Section 21 00 00 - Fire Protection

D. Section 23 00 00 - Heating, Ventilating, & Air Conditioning

PART 2 - PRODUCTS

2.01 PIPING ACCESSORIES

A. Unions
   1. Shall have the same pressure rating as pipe fittings.

B. Check Valves
   1. Swing check, Class 125 Buna-N Disc, NIBCO or equal.
      a. Sizes 2 inch and smaller: Fig. T-413; bronze body, threaded ends, plug type bonnet.
      b. Size 2-1/2 inch and larger: Fig. F-968: iron body, brass mounted, flanged ends, bolted bonnet.

C. Strainers
   1. Watts, Armstrong, Sarco, Arco, Sizes 4” and smaller, Watts Series 777, 400 psi WOG bronze body, threaded or soldered ends, 20 mesh stainless steel screen (up to 2 ½”), 3/64” perforated stainless steel screen (3”), 1/8” perforated stainless steel screen (4”), solid threaded screen retainer cap with gasket.
   2. Reduced Pressure Back Flow Preventers
   3. ¾” to 2”, Watts Series 909, provide bronze strainer, resilient seated full port bronze ball valves, air gap fitting and drain line, replaceable bronze seats.
   4. 2 ½” to 10”, Watts Series 909, provide bronze strainer, non-rising stem resilient seated gate valve shut-offs, air gap fitting and drain line, replaceable bronze seats.

D. Water Pressure Reducing Valves
   1. ¾” to 3”, Watts Series 223, provide y-strainer, replaceable stainless steel seat, bronze body construction, water tight sealed cage assembly, removable disc holder, low pressure model adjustable from 10-35 psi., high pressure model adjustable from 50 to 145 psi (1/2” to 1”), 50 to 120 psi (1 ¼”), and 50 to 95 (1 ½” to 3”).

E. Piping Penetration Auxiliaries
   1. Sleeves Below Slab or Grade: Metraseal model MS or equal with schedule 80 PVC sleeve. The seal shall be capable of withstanding a hydrostatic pressure of 20 psig. The seal shall be constructed of synthetic rubber with heavy-duty plastic pressure plates. All bolts and nuts shall be constructed of stainless steel.
   2. Escutcheons: Polished chrome plated brass or painted metal.

PART 3 - EXECUTION

3.01 EQUIPMENT

A. Install equipment in accordance with the manufacturer’s installation instructions, as specified herein, and as detailed on the drawings.

3.02 VALVES, UNIONS AND FLANGES

A. Valves shall be full size of line in which installed. Furnish discs suitable for service intended. All valves shall be properly packed and lubricated. Unions shall be placed adjacent to each threaded or soldered valve or equipment connection 2" and smaller. Install flanges at all valves with stems vertical wherever possible. Stems shall not be placed below horizontal.

B. Install unions adjacent to each valve and at final connection to each piece of equipment.

C. Valves shall be provided with brass identification tags indicating service controlled. Tags may be omitted on lines exposed in equipment rooms where service is obvious.

D. Cathodic Protection: Install insulated flanges or dielectric unions at points of connection between pipes and equipment as follows: (1) between copper or brass piping and steel or cast iron pipe. (2) Between copper or brass piping and any steel material. (3) Buried connections of copper or brass piping to steel or cast iron piping shall be protected with a polyvinyl tape wrap 10 mils thick, extending 5' each way from connection.

E. Expansion: Install piping with sufficient offsets, loops, and/or swing-joints to allow for expansion and contraction. Anchor piping at equipment to restrain movement at those locations.

F. Freeze Protection: Piping shall not be installed in a location subject to freezing conditions. All piping shall and must be installed on the “warm” side of building envelope insulation without exception. Where risers occur in outside walls, ensure that building insulation is adequate and intact. All piping must be drainable; provide drains required. All piping shall be run in or above heated portion of the building.

3.03 FIELD QUALITY CONTROL

A. Water Sterilization
   1. After installation and before the Contractor installs all valves, test ports, or making final connections, flush or purge piping systems clean of foreign substances; use water to flush piping conducting liquids and compressed air to clear piping conducting gases.
   2. After completing cold and heated water systems, disinfect in accordance with current requirements of U.S. Public Health Department. Use 50 parts per million of chlorine with 8 hour retention and flush to leave a residual no greater than supply source. Submit written certification of disinfecting completion by independent laboratory. After sterilization take at a minimum of one (1) water sample per floor and have analyzed for "E-coli" to submit test results.

B. Piping Testing: Testing Criteria

System	Medium	Pressure	Duration
Water	Water	150 psig	4 hours

END OF SECTION

SECTION 22 11 23
WATER PUMPS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The requirements of the GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS, and DIVISION 1 GENERAL REQUIREMENTS, apply to the work of this section.

B. Division 22.

PART 2 - PRODUCTS

2.01 IN-LINE PUMPS

A. Shall be Bell & Gossett, Paco, Taco, in-line single-stage, single suction, close coupled bronze fitted pumps furnished complete with motor.

B. Pump housing shall have gauge and drain tappings and shall be of Class 30 cast iron construction suitable for servicing the internal parts without disturbing the connecting piping.

C. Impeller shall be bronze, enclosed, statically and dynamically balanced, and fitted to shaft with a key and locked in place.

D. Pump shall have internally flushed mechanical seal with a ceramic seal seat and carbon seal ring fitted with a bronze shaft sleeve that shall completely cover the wetted area under the seal

E. See schedule on drawings for size, capacity and duty.

F. Motors shall have heavy duty grease lubricated ball bearings. All motors over 1 HP shall be NEMA Premium efficiency, Century Model E Plus III, Reliance XE, or equal, 1.15 service factor, single speed. Motor shall be of the enclosure type called for on the plans.. Motors shall be able to overcome starting load inertia as well as accelerating the load to rated speed under both rated and at 10 percent reduced voltage conditions during starting without excessive heating.

G. See schedule for power requirements

2.02 CLOSE-COUPLE CENTRIFUGAL PUMPS

A. Shall be Bell & Gossett, Paco, Taco, bronze fitted pumps furnished complete with motor and base as scheduled on the drawings..

B. See schedule on drawings for size, capacity and duty.

C. Pump volute shall have gauge and drain tappings and shall be of cast iron construction suitable for servicing the internal parts without disturbing the connecting piping or the pump motor.

D. Pump shall be rated for a minimum of 175 psi working pressure.

E. Impeller shall be bronze, enclosed, statically and dynamically balanced, and fitted to shaft with a key and locked in place. All fixed speed pumps shall have the impeller trimmed after installation to match the pump to the specified gpm.

F. Pump shall have mechanical shaft fitted with a bronze sleeve and the bearing frame assembly shall be fitted with re-greasable ball bearings for quiet operation.

G. The liquid cavity shall be sealed off at the pump shaft by an internally-flushed mechanical seal with ceramic seal seat and carbon seal ring, suitable for continuous operation at 225o F. A replaceable bronze shaft sleeve shall completely cover the wetted area under the seal.

H. Base plate shall be of structural steel or fabricated steel channel with fully enclosed sides and ends, and securely welded cross members. Grouting area shall be fully opened. A flexible type,

center drop-out design coupler, capable of absorbing torsional vibration, shall be employed between the pump and motor.

I. A flexible coupler shall be employed between the pump and motor and it shall be fitted with a suitable OSHA approved coupling guard.

J. Motors shall be NEMA Premium efficiency, Century Model E Plus III, Reliance XE, or equal, open drip proof, 1.15 service factor, single speed. Motors shall be able to overcome starting load inertia as well as accelerating the load to rated speed under both rated and at 10 percent reduced voltage conditions during starting without excessive heating. Motors connected with VFDs shall be rated for such.

K. Pump and motor shall be factory aligned, and shall be realigned by contractor after installation.

L. Each pump shall be factory tested per Hydraulic Institute standards. It shall then be thoroughly cleaned and painted with at least one coat of high-grade machinery enamel prior to shipment.

M. See schedule for power requirements.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Lubrication: Where equipment includes poorly accessible lubrication points, provide tubing extensions to readily accessible points and terminate with appropriate lubrication fitting.

B. Miscellaneous: Install belt and coupling guards and other miscellaneous items as required.

C. All pump bases shall be grouted.

END OF SECTION

SECTION 22 13 00
FACILITY SANITARY SEWERAGE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The requirements of the GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS, SPECIAL CONDITIONS and DIVISION 1 GENERAL REQUIREMENTS, apply to the work of this section.

B. Section 22 05 00 applies to this section.

1.02 SUMMARY

A. This section includes plumbing waste pipe and fittings, specialties) inside the building(s) and outside the building(s) to the point of connection to site plumbing systems.

B. Provide complete plumbing systems including:
   1. Service connections to existing on-site utilities, and stubs for future connection to equipment provided under the work of this Section or other Sections of the Specifications.
   2. All piping systems for conduction of soil, waste, and other fluids or gases as shown or specified for plumbing work.
   3. All valves, piping supports, piping penetration auxiliaries, piping protective coverings, piping, and other piping accessories as shown or specified for plumbing work.
   4. All plumbing equipment and auxiliary items as specified herein or shown on the drawings.

1.03 RELATED SECTIONS

A. Section 023 41 13 – Selective Site Demolition: Restoration of Paving and Site Improvements

B. Section 22 05 00 - Plumbing

C. Section 22 07 00 - Insulation

D. Section 23 00 00 - Heating, Ventilating, & Air Conditioning

1.04 STRUCTURAL REQUIREMENTS

A. Structural members shall not be cut or modified in any manner without specific instructions from the structural engineer. Where possible, offset vents and pipes rising in walls, concealed above ceilings, below plates and rise through roof. Where this is not possible, install vents and pipes through plates as detailed on structural drawings.

1.05 SUBMITTALS

A. Submit a general statement of materials and methods along with manufacturer's technical data and installation instructions for all equipment, fixtures, pipe and fittings, and plumbing specialties to be installed.

B. Record Drawings: Per specification section 22 05 00 requirements.
   1. Operation and Maintenance Manuals: Per specification section 22 01 00 requirements.

PART 2 - PRODUCTS

PART 3 - EXECUTION

3.01 MINIMUM COVER

A. Provide trenching and backfill for buried piping and install with the following unless shown otherwise, cover is from top of pipe to finish grade. Refer to the plumbing plans for invert elevations.

3.02 INSTALLATION OF PIPING SYSTEMS

A. General
   1. Sleeves: Install sleeves of sufficient size to allow for free motion of pipe. Finish sleeves flush when in walls and extend a minimum of 2" above floor when passing through floor slabs and outside walls shall be caulked with oakum and mastic and made watertight. No visible leakage at sleeves will be permitted. Sleeves may be omitted for waste lines through slabs on grade and rising into a concealed space if wrapped with 1" insulation. Sleeve all pipes where pipes pass through footings with PVC pipe sleeves.
   2. Expansion: Install piping with sufficient offsets, loops, and/or swing joints to allow for expansion and contraction. Anchor piping at equipment to restrain movement at those locations.

3.03 EXCAVATING AND TRENCHING

A. Perform all excavations as required for the installation of the work included under this section, including shoring of earth banks to prevent cave-ins and to protect workmen and equipment. Restore all surfaces, roadways, walks, curb, walls, existing underground installations, etc. damaged or cut as a result of the excavations to their original conditions in a manner approved by the architect. Excavations shall be ample in size to permit pipes or equipment to be laid at elevations intended, and to permit ample space for caulking and joining and compacting backfill around pipe. Maintain all warning signs, barricades, flares and red signal lanterns as required by the Safety Orders of the Division of Industrial Safety and local ordinances. Perform all pumping required to remove all water from trenches during installation of piping and backfilling.

B. Stop machine excavation for pipe trenches in solid ground, several inches above required grade, so that a firm and uniform bearing throughout entire length of pipe is provided. In lieu of above hand excavation on bottom of trench, the contractor may excavate to a depth one quarter of the nominal diameter of pipe, but in no case excavate less than 6" below required grade line, and place a bed of sand or granular soil, properly compacted to provide a uniform grade and to provide a firm support for pipe throughout its entire length. When pipe or underground conduit with insulation or protective coating is to be placed in the trench, clean sand only shall be used for bedding the pipe or conduit.

3.04 BACKFILLING

A. No backfilling operations shall begin until the required tests and inspections have been made and the Architect has given approval for backfilling. Should any of the work be enclosed or covered up before it has been approved, contractor shall, at his expenses, uncover the work. After it has been inspected, tested and approved, he shall make all repairs necessary to restore the work of the other contractor to the condition in which it was found at the time of uncovering. Insulated pipe and pipe with protective coating shall be backfilled with clean, concrete grade sand for a minimum distance of 12" above the top of the pipe. Compact sand backfill by flooding or jetting. Protect pipe from uplift during jetting operation.

B. Except under existing paved areas, walks, roads, or similar surfaces, and in cases where rock is encountered, backfill more than 12" above the top of the pipe shall be made using suitable excavated material or other approved material as necessary. The backfill shall be placed in 6" layers, measured before compaction, and tamped either by hand or machine.

3.05 CROSSING EXISTING UTILITIES

A. Extreme care shall be exercised during excavation across existing utility lines particularly gas and electrical lines for trenching to install new utility lines. Hand excavate all trenches in the proximity of existing lines so as not to damage or cut into them.

B. All existing utility and service lines shall be located by hand excavation prior to trenching with equipment.

C. The location, depth and invert elevations of all existing utilities to be crossed or to which connecting shall be determined before performing any other work or ordering any materials for the project.

3.06 RESTORATION OF EXISTING IMPROVEMENTS

A. Selective site demolition to provide all new utilities and utility connections, including all existing improvement removal; and all improvement restoration work.

B. Utility paths are shown diagrammatically on Plans, and it is the Contractor's responsibility to determine the actual routes.

3.07 PROTECTION FROM DAMAGE

A. Protect adjacent work and materials as well as the Mechanical work and material from damage during construction. Cap and/or plug all piping at the completion of roughing-in and before backfilling. Cap all piping at the close of each day.

3.08 FINAL CONNECTIONS

A. Contractor shall verify location of and make all final connections to site utilities.

3.09 PIPING TESTING: TESTING CRITERIA

System	Medium	Pressure	Duration
Drainage and Vent	Water	10 feet water	15 minutes

END OF SECTION

This page intentionally left blank

SECTION 22 13 16
SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The requirements of the GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS, SPECIAL CONDITIONS and DIVISION 1 GENERAL REQUIREMENTS, apply to the work of this section.

B. Section 22 05 00 applies to this section.

1.02 SUMMARY

A. This section includes all plumbing (equipment, fixtures, pipe and fittings, specialties) inside the building(s) and outside the building(s) to the point of connection to site plumbing systems.

B. Provide complete plumbing systems including:
   1. Service connections to existing on-site utilities, and stubs for future connection to equipment provided under the work of this Section or other Sections of the Specifications.
   2. All piping systems for conduction of soil, waste, and other fluids or gases as shown or specified for plumbing work.
   3. All valves, piping supports, piping penetration auxiliaries, piping protective coverings, piping, and other piping accessories as shown or specified for plumbing work.
   4. All plumbing equipment and auxiliary items as specified herein or shown on the drawings.

1.03 RELATED SECTIONS

A. Section 22 05 00 - Plumbing

B. Section 22 07 00 - Insulation

C. Section 23 00 00 - Heating, Ventilating, & Air Conditioning

1.04 QUALITY ASSURANCE

A. All plumbing fixtures and equipment shall comply with California Code of Regulations, Title 24, Part 6, latest edition.

1.05 REFERENCES

A. Pipes and Tubes
   1. Steel Pipe: ASTM A53, Type S, Grade A, Schedule 40, seamless, black or galvanized, plain ends.
   2. Copper Drainage Tube: ASTM B306, Type DWV, drawn temper.
   3. Hubless, Cast-Iron Soil Pipe: CISPI 301.
   4. Polyethylene Pipe: ASTM D2513 produced to APWA/ULCC standards for color coding of gas distribution systems.

B. Fittings
   1. Wrought-Copper, Solder-Joint Pressure Fittings: ANSI B16.22.
   2. Cast-Copper-Alloy, Solder-Joint Pressure Fittings: ASME B16.18, ASTM B584.
   3. Cast-Copper-Alloy, Threaded -Joint Pressure Fittings: ANSI/ASME B16.15, ASTM B584.
   4. Bronze Flanges: ASME B16.24, Classes 150 and 300.
   5. Copper Unions: ASME B16.18, cast-copper-alloy body, hexagonal stock, with ball-and-socket joint, metal-to-metal seating surfaces, and solder-joint, threaded, or solder-joint and threaded ends. Threads complying with ASME B1.20.1.
   6. Steel Pipe Nipples: ASTM A733, made of ASTM A53 or ASTM A106, Schedule 40, seamless, galvanized, carbon-steel pipe.

7. Malleable-Iron Unions: ASME B16.39, Classes 150 and 300; hexagonal stock; with ball-and-socket joint; metal-to-metal bronze seating surfaces; and female threaded ends with threads complying with ASME B1.20.1.
8. Galvanized, Cast-Iron Threaded Fittings: ASME B16.4, Classes 125 and 250; standard pattern; with threads complying with ASME B1.20.1.
9. Wrought-Copper, Solder-Joint, DWV Drainage Fittings: ASME B16.29.
10. Cast-Copper-Alloy, Solder-Joint, DWV Drainage Fittings: ASME B16.23.
11. Plastic Pipe Sleeves: ASTM C564 rubber for cast-iron soil pipe and ASTM F477 elastomeric seal.
12. Polyethylene Plastic: ASTM D2683 and D3261,socket or butt fusion fittings.

C. Joining Materials
1. CISPI Couplings for Hubless, Cast-Iron Soil Pipe and Fittings: CISPI 310, having ASTM C564 neoprene sealing sleeve, with 300 series stainless-steel, corrugated shield-and-clamp assembly.
2. Solder Filler Metal: ASTM B32, alloys to suit system requirements.
3. Brazing Filler Metals: AWS A5.8, alloys to suit system requirements.
4. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

D. Plastic Pipe Seals: ASTMF477, elastomeric gasket.

1.06 STRUCTURAL REQUIREMENTS

A. Structural members shall not be cut or modified in any manner without specific instructions from the structural engineer. Where possible, offset vents and pipes rising in walls, concealed above ceilings, below plates and rise through roof. Where this is not possible, install vents and pipes through plates as detailed on structural drawings.

1.07 SUBMITTALS

A. Submit a general statement of materials and methods along with manufacturer’s technical data and installation instructions for all equipment, fixtures, pipe and fittings, and plumbing specialties to be installed.

B. Record Drawings: Per specification section 22 05 00 requirements.

C. Operation and Maintenance Manuals: Per specification section 22 05 00 requirements.

PART 2 - PRODUCTS

2.01 GENERAL

A. Adapters: Wrought copper male adapters shall be used wherever it is necessary to connect copper tubing to a valve or "tee" having threaded connections.

2.02 PIPE, FITTING, AND JOINING MATERIALS

A. Hubless Cast-Iron/Sleeve-Clamped Joints
1. Pipe: Service weight cast iron, hubless, with hot coal tar pitch coating inside and outside, per Cast-Iron Soil Pipe Institute Standard 301.
2. Fittings: Hubless type, Tyler No-Hub Coupling, each matched with pipe and identified with the manufacturer's name or trademark, the Cast-Iron Soil Pipe Institute symbol, and the pipe size. Those for connections to other types of piping - approved cast-iron adapter/transition type.

3. Joining Materials/Methods: Husky Series 4000 (Blue shield) or Mission Heavy Weight Orange shield) on pipes over 3”, neoprene sleeve type conforming to ASTM C564 specifically designed for connecting hubless cast-iron pipe, coated with manufacturer's

recommended lubricant before installing; four type 304 stainless steel band clamps with a type 305 stainless steel worm drive screw, and corrugated shield over sleeve; use standard no-hub couplings on pipe 3" and less.
   a. "Tyler, Standard", two band stainless steel coupling, Stainless Steel screw housing, Stainless Steel shield, shall be used for vent piping.
4. Wedge lock joints at rainwater leaders to underground drain.
5. Cleanout Plugs: Use Armite Joint Seal compound No. 411, or Enterprise Commercial Thread-Seal.

B. Steel/Cast-Iron Threaded Drainage Fittings
1. Pipe: Galvanized steel per ASTM A-120, threaded ends, standard weight Schedule 40.
2. Fittings: Cast-iron threaded drainage type, black coated, with recessed shoulder and pitched threads, per ASTM A-126, Class B.

C. Copper DWV Pipe: DWV drainage tubing per ASTM B-306-86, plain ends for pipe 1 ½" and larger.
1. Fittings shall be solder type, wrought copper drainage fittings per ANSI Standard B16.29-86.
2. Joining Materials/Methods: Canfield, Silvabrite or equal lead-free solder with a non-corrosive water based flux.
3. Connections:
   a. Copper to dissimilar metals: dielectric connector.
   b. Copper to threaded connections: cast brass adapters.

D. Steel/Threaded Fittings
1. Pipe: Black or galvanized steel per ASTM A-53 seamless, threaded ends, standard weight Schedule 40 or Schedule 80.
2. Fittings
   a. Black or galvanized (to match pipe) banded malleable iron, threaded, ASTM A-197, 150 lb. standard or 300 lb. extra heavy per ANSI Standard B16.3 (to match pipe schedule).
   b. Black or galvanized (to match pipe) banded cast iron, threaded, per ASTM A-126 Class B, 125 lb. standard or 250 lb. extra heavy per ANSI Standard B16.4 (to match pipe schedule).
3. Unions: AAR 300 lb. malleable iron, black or galvanized (to match pipe).
4. Joining Materials/Methods
   a. Rectorseal or pure lead and graphite thread lubricant.
   b. Permacel, P-412 1/2" wide teflon pipe joint sealant.

E. Polyethylene plastic butt fusion welded joints

1. Pipe: Schedule 40, plain ends.
   a. Fittings: Polyethylene fusion welded type.
   b. Joining Materials/Methods: Fusion welded, using fusion welding fittings, and the manufacturers supplied control unit.
   c. Connections: Utilize only adapters supplied by the same manufacturer of the pipe.

F. Manville Ring-Tite PVC sewer pipe, SDR-35, ASTM D 3034 (Outside the building). Use materials per utility standards off site - where applicable.

G. Johns Manville, C-900, Blue Brut, PVC pipe and fittings, Class 200, installed in strict accordance with manufacturer's published instructions, (Outside the building).

H. Johns Manville Blue Brut PVC pipe and fittings U.L. approved for fire protection, (Outside the building).

2.03 PIPE AND FITTING APPLICATIONS

A. Inside Building (to 5'-0" outside building line).
   1. Soil, waste and vent piping
      a. Below slab, service weight cast iron soil pipe and fittings, asphaltic coated for sizes 2 1/2" and smaller. Above floor from 6" above slab shall be galvanized steel pipe or service weight cast iron soil pipe and fittings, asphaltic coated for sizes 2 1/2" and smaller. Urinal waste shall be service weight cast iron soil pipe and fittings, asphaltic coated. Sizes 3" and larger shall be service weight cast iron soil pipe and fittings, asphaltic coated.
      b. Fittings
         1) Contractor may use "No-Hub" "Husky" joints per manufacturers published instructions for installation. No-Hub fittings for waste and soil pipe shall be four band stainless steel type. “Tyler, Standard”, two band stainless steel coupling, Stainless Steel screw housing, Stainless Steel shield, shall be used for vent piping.
      c. As an alternate use, copper DWV Pipe.
   2. Condensate Drain Piping: Type M, drawn temper copper tube, joining method, soldered connections. Connect to equipment with P-trap and clean out plug.
   3. Use PVC pipe for all condensing heating equipment condensate drains.
   4. Plastic pipe and fittings shall not be used inside of buildings, except as permitted for acid waste and vent systems.

B. Outside Building (from 5'-0" outside building line)
   1. Sewers: Sanitary pipe shall be first quality Johns Manville Ring-Tite PVC sewer pipe. Use cast iron pipe and fittings where 12" minimum bury cannot be maintained and other locations where indicated. Use materials per utility standards off site - where applicable.

PART 3 - EXECUTION

3.01 EQUIPMENT

A. Install equipment in accordance with the manufacturer’s installation instructions, as specified herein, and as detailed on the drawings.

3.02 PIPING

A. Provide trenching and backfill for buried piping and install with the following minimum cover unless shown otherwise, cover is from top of pipe to finish grade.

B. Sewer Piping: Run all horizontal sanitary piping inside of the building at a uniform grade of not less than ¼" per foot unless otherwise noted on the drawings. Sewers shall have invert elevations as shown and slope uniformly between given elevations. All drainage piping shall be run as straight as possible and shall have long radius bends. All offsets shall be made at an angle of 45 degrees or less. All vent piping shall be graded so as to free itself quickly of any water or condensation. Where possible, groups of vent risers shall be jointed together with one enlarged outlet through roof.
   1. Install clean-outs of the same diameter of pipe in all horizontal soil and waste lines where indicated and at all points of change in direction and at base of all soil or waste drops. Locate-clean outs not less than 18” from building construction so as to provide sufficient space for rodding. No horizontal runs of more than 100 feet shall be without clean-out.
   2. Clean-outs in floors shall be protected with a cover taped in place and removed at completion of concrete work.
   3. Provide trap at each inlet to sanitary sewer system. Provide trap primers where shown and as required by code.

C. Bury a No. 18 AWG insulated copper locating wire with all non-metallic pipe. Copper wire shall have at least 12” above grade at each end.

D. Condensate drain piping:
   1. Provide "P" trap having 2" minimum trap seal or manufacturers recommendations.
   2. Install trap with top of trap outlet 2" minimum below bottom of condensate collection pan, and within 12" of pan outlet.
   3. Make changes in direction in the condensate drain line using tees; fit the free leg of the tee with a screwed plug for clean-outs. Provide additional such clean-outs where required by code or where necessary for cleaning drain line.
   4. Extend condensate drain line to appropriate disposal point, receptor, or sewer as prescribed by code or shown on drawings.
   5. Insulation: Provide insulation as shown or specified (Section 22 07 00).

3.03 VENT LOCATIONS

A. Plumbing fixture vents have been combined wherever possible to minimize the number of roof penetrations.

B. Roof penetrations have been coordinated with all other building penetrations.

C. Contractor shall not shift or relocate vents through the roof or other penetrations from the locations shown without prior approval of the Architect.

3.04 FIELD QUALITY CONTROL

A. Piping Testing:
   1. Testing Criteria

System	Medium	Pressure	Duration
Drainage and Vent	Water	10 ft water	15 minutes

END OF SECTION

This page intentionally left blank

SECTION 22 13 19
SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The requirements of the GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS, SPECIAL CONDITIONS and DIVISION 1 GENERAL REQUIREMENTS, apply to the work of this section.

B. Section 22 01 00 applies to this section.

1.02 SUMMARY

A. This section includes all plumbing (equipment, fixtures, pipe and fittings, specialties) inside the building(s) and outside the building(s) to the point of connection to site plumbing systems.

B. Provide complete plumbing systems including:
   1. Service connections to existing on-site utilities, and stubs for future connection to equipment provided under the work of this Section or other Sections of the Specifications.
   2. All piping systems for conduction of cold water, heated water, soil, waste, fuel gas, and other fluids or gases as shown or specified for plumbing work.
   3. All valves, piping supports, piping penetration auxiliaries, piping protective coverings, piping, and other piping accessories as shown or specified for plumbing work.
   4. All plumbing equipment and auxiliary items as specified herein or shown on the drawings.

1.03 RELATED SECTIONS

A. Section 22 05 00 - Plumbing

B. Section 22 07 00 - Insulation

C. Section 21 00 00 - Fire Protection

D. Section 23 00 00 - Heating, Ventilating, & Air Conditioning

PART 2 - PRODUCTS

2.01 PIPING ACCESSORIES

A. Cleanouts: Model Numbers are Josam.
   1. Vertical: with polished bronze cover.
   2. Floor: with nickel-bronze cover. Provide carpet clean out marker in carpeted areas.
   3. Grade: C.I. with brass plug set in concrete.
   4. Use floor clean outs where located in walks.

2.02 PIPING PENETRATION AUXILLIARIES

A. Sleeves Below Slab or Grade: Metraseal model MS or equal with schedule 80 PVC sleeve. The seal shall be capable of withstanding a hydrostatic pressure of 20 psig. The seal shall be constructed of synthetic rubber with heavy-duty plastic pressure plates. All bolts and nuts shall be constructed of stainless steel.
   1. Escutcheons: Polished chrome plated brass or painted metal.

PART 3 - EXECUTION

3.01 EQUIPMENT

A. Install equipment in accordance with the manufacturer's installation instructions, as specified herein, and as detailed on the drawings.

3.02 VALVES AND FLANGES

A. Valves shall be full size of line in which installed. Furnish discs suitable for service intended. All valves shall be properly packed and lubricated. Unions shall be placed adjacent to each threaded or soldered valve or equipment connection 2" and smaller. Install flanges at all valves with stems vertical wherever possible. Stems shall not be placed below horizontal.

B. Valves shall be provided with brass identification tags indicating service controlled. Tags may be omitted on lines exposed in equipment rooms where service is obvious.

C. Cathodic Protection: Install insulated flanges or dielectric unions at points of connection between pipes and equipment as follows: (1) between copper or brass piping and steel or cast iron pipe. (2) Between copper or brass piping and any steel material. (3) Buried connections of copper or brass piping to steel or cast iron piping shall be protected with a polyvinyl tape wrap 10 mils thick, extending 5' each way from connection.

3.03 FIELD QUALITY CONTROL

A. Piping Testing: Testing Criteria

System	Medium	Pressure	Duration
Drainage and Vent	Water	10 feet water	15 minutes

END OF SECTION

SECTION 22 14 00
FACILITY STORM DRAINAGE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The requirements of the GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS, SPECIAL CONDITIONS and DIVISION 1 GENERAL REQUIREMENTS, apply to the work of this section.

B. Section 22 05 00 applies to this section.

1.02 SUMMARY

A. This section includes all plumbing (equipment, fixtures, pipe and fittings, specialties) inside the building(s) and outside the building(s) to the point of connection to site plumbing systems.

B. Provide complete plumbing systems including:
   1. Service connections to existing on-site utilities, and stubs for future connection to roof drains provided under the work of this Section or other Sections of the Specifications.
   2. All piping systems for conduction of rain water as shown or specified for plumbing work.
   3. All valves, piping supports, piping penetration auxiliaries, piping protective coverings, piping, and other piping accessories as shown or specified for plumbing work.
   4. All plumbing equipment and auxiliary items as specified herein or shown on the drawings.

1.03 RELATED SECTIONS

A. Section 02 41 13 – Selective Site Demolition: Restoration of Paving and Site Improvements

B. Section 22 05 00 - Plumbing

C. Section 22 07 00 - Insulation

D. Section 21 00 00 - Fire Protection

E. Section 23 00 00 - Heating, Ventilating, & Air Conditioning

1.04 STRUCTURAL REQUIREMENTS

A. Structural members shall not be cut or modified in any manner without specific instructions from the structural engineer. Where possible, offset vents and pipes rising in walls, concealed above ceilings, below plates and rise through roof. Where this is not possible, install vents and pipes through plates as detailed on structural drawings.

1.05 SUBMITTALS

A. Submit a general statement of materials and methods along with manufacturer's technical data and installation instructions for all equipment, fixtures, pipe and fittings, and plumbing specialties to be installed.

B. Record Drawings: Per specification section 22 05 00 requirements.
   1. Operation and Maintenance Manuals: Per specification section 22 01 00 requirements.

PART 2 - PRODUCTS

2.01 SAME AS SEWERAGE SEE SECTIONS 22 13 00

PART 3 - EXECUTION

3.01 SAME AS SEWERAGE SEE SECTIONS 22 13 00

END OF SECTION

SECTION 22 14 16
RAINWATER LEADERS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The requirements of the GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS, SPECIAL CONDITIONS and DIVISION 1 GENERAL REQUIREMENTS, apply to the work of this section.

B. Section 22 05 00 applies to this section.

C. See 22 07 19

1.02 SUMMARY

A. This section includes all plumbing (equipment, fixtures, pipe and fittings, specialties) inside the building(s) and outside the building(s) to the point of connection to site plumbing systems.

B. Provide complete plumbing systems including:
   1. Service connections to existing on-site utilities, and stubs for future connection to equipment provided under the work of this Section or other Sections of the Specifications.
   2. All piping systems for conduction of soil, waste, and other fluids or gases as shown or specified for plumbing work.
   3. All valves, piping supports, piping penetration auxiliaries, piping protective coverings, piping, and other piping accessories as shown or specified for plumbing work.
   4. All plumbing equipment and auxiliary items as specified herein or shown on the drawings.

1.03 RELATED SECTIONS

A. Section 22 05 00 - Plumbing

B. Section 22 07 00 - Insulation

C. Section 21 00 00 - Fire Protection

D. Section 23 00 00 - Heating, Ventilating, & Air Conditioning

1.04 QUALITY ASSURANCE

A. All plumbing fixtures and equipment shall comply with California Code of Regulations, Title 24, Part 6, latest edition.

1.05 REFERENCES

A. Pipes and Tubes
   1. Hubless, Cast-Iron Soil Pipe: CISPI 301.

B. Fittings
   1. Steel Pipe Nipples: ASTM A733, made of ASTM A53 or ASTM A106, Schedule 40, seamless, galvanized, carbon-steel pipe.
   2. Malleable-Iron Unions: ASME B16.39, Classes 150 and 300; hexagonal stock; with ball-and-socket joint; metal-to-metal bronze seating surfaces; and female threaded ends with threads complying with ASME B1.20.1.

C. Joining Materials
   1. CISPI Couplings for Hubless, Cast-Iron Soil Pipe and Fittings: CISPI 310, having ASTM C564 neoprene sealing sleeve, with 300 series stainless-steel, corrugated shield-and-clamp assembly.

1.06 STRUCTURAL REQUIREMENTS

A. Structural members shall not be cut or modified in any manner without specific instructions from the structural engineer. Where possible, offset vents and pipes rising in walls, concealed above ceilings, below plates and rise through roof. Where this is not possible, install vents and pipes through plates as detailed on structural drawings.

1.07 SUBMITTALS

A. Submit a general statement of materials and methods along with manufacturer's technical data and installation instructions for all equipment, fixtures, pipe and fittings, and plumbing specialties to be installed.

B. Record Drawings: Per specification section 22 05 00 requirements.

C. Operation and Maintenance Manuals: Per specification section 22 01 00 requirements.

PART 2 - PRODUCTS

2.01 GENERAL

A. Adapters: Wrought copper male adapters shall be used wherever it is necessary to connect copper tubing to a valve or "tee" having threaded connections.

2.02 PIPE, FITTING, AND JOINING MATERIALS

A. Hubless Cast-Iron/Sleeve-Clamped Joints
   1. Pipe: Service weight cast iron, hubless, with hot coal tar pitch coating inside and outside, per Cast-Iron Soil Pipe Institute Standard 301.
   2. Fittings: Hubless type, Tyler No-Hub Coupling, each matched with pipe and identified with the manufacturer's name or trademark, the Cast-Iron Soil Pipe Institute symbol, and the pipe size. Those for connections to other types of piping - approved cast-iron adapter/transition type.
   3. Joining Materials/Methods: Husky Series 4000 (Blue shield) or Mission Heavy Weight Orange shield) on pipes over 3", neoprene sleeve type conforming to ASTM C564 specifically designed for connecting hubless cast-iron pipe, coated with manufacturer's recommended lubricant before installing; four type 304 stainless steel band clamps with a type 305 stainless steel worm drive screw, and corrugated shield over sleeve; use standard no-hub couplings on pipe 3" and less
   4. Wedge lock joints at rainwater leaders to underground drain.
   5. Cleanout Plugs: Use Armite Joint Seal compound No. 411, or Enterprise Commercial Thread-Seal.

2.03 PIPE AND FITTING APPLICATIONS

A. Inside Building (to 5'-0" outside building line).
   1. Rainwater leader piping
      a. Below slab, service weight cast iron soil pipe and fittings, asphaltic coated for sizes 2 1/2" and smaller. Above floor from 6" above slab shall be galvanized steel pipe or service weight cast iron soil pipe and fittings, asphaltic coated for sizes 2 1/2" and smaller. Sizes 3" and larger shall be service weight cast iron soil pipe and fittings, asphaltic coated.
      b. Fittings
         1.) Contractor may use "No-Hub" "Husky" joints per manufacturers published instructions for installation. No-Hub fittings for waste and soil pipe shall be four band stainless steel type.
   2. Plastic pipe and fittings shall not be used inside of buildings.

PART 3 - EXECUTION

3.01 EQUIPMENT

A. Install equipment in accordance with the manufacturer's installation instructions, as specified herein, and as detailed on the drawings.

3.02 PIPING

A. For underground pipe, provide trenching and backfill for buried piping and install with the following minimum cover unless shown otherwise, cover is from top of pipe to finish grade.
   1. Rainwater leaders - 30"

B. Rainwater Leader Piping: Run all horizontal piping inside of the building at a uniform grade of not less than ¼" per foot unless otherwise noted on the drawings. Pipe shall have invert elevations as shown and slope uniformly between given elevations. All drainage piping shall be run as straight as possible and shall have long radius bends. All offsets shall be made at an angle of 45 degrees or less.
   1. Install clean-outs of the same diameter of pipe in all horizontal lines where indicated and at all points of change in direction and at base of all drops. Locate-clean outs not less than 18" from building construction so as to provide sufficient space for rodding. No horizontal runs of more than 100 feet shall be without clean-out.
   2. Clean-outs in floors shall be protected with a cover taped in place and removed at completion of concrete work.
   3. Provide trap at each inlet to rainwater system.

3.03 FIELD QUALITY CONTROL

A. Piping Testing:
   1. Testing Criteria

System	Medium	Pressure	Duration
Rainwater Leader	Water	10 ft water	15 minutes

END OF SECTION

This page intentionally left blank

SECTION 22 40 00
PLUMBING FIXTURES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The requirements of the GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS, SPECIAL CONDITIONS and DIVISION 1 GENERAL REQUIREMENTS, apply to the work of this section.

B. Section 22 05 00 applies to this section.

1.02 SUMMARY

A. This section includes all plumbing fixtures.

1.03 RELATED SECTIONS

A. Section 22 05 00 – Common Work Results For Plumbing

B. Section 22 07 00 - Insulation

C. Section 21 00 00 - Fire Protection

1.04 QUALITY ASSURANCE

A. All plumbing fixtures and equipment shall comply with California Code of Regulations, Title 24, Part 6, latest edition.

1.05 SUBMITTALS

A. Submit a general statement of materials and methods along with manufacturer's technical data and installation instructions for all equipment, fixtures, pipe and fittings, and plumbing specialties to be installed.

B. Record Drawings: Per specification section 22 05 00 requirements.

C. Operation and Maintenance Manuals: Per specification section 22 05 00 requirements.

PART 2 - PRODUCTS

2.01 GENERAL

A. See fixture and equipment schedules on drawings.

PART 3 - EXECUTION

3.01 PLUMBING FIXTURES

A. All fixtures shall be furnished as scheduled. All finished plumbing shall be accurately lined up and where batteries of fixtures occur, special care shall be taken with the roughing-in and finished plumbing.

B. The number and position of all plumbing fixtures are shown on the plumbing drawings. Consult architectural drawings for the location dimensions and mounting heights of fixtures. Heights shall comply with the C.B.C., the latest handicapped requirement, and all ADA requirements.

C. All water supplied to fixtures shall be provided with Speedway loose key compression shut-off stops. Combination fixtures shall have compression stop on each water supply fitting. Concealed stops shall be Crane 9H-313 or equal.

D. All finish for exposed metal trim on any fixture shall be polished chromium plated. This shall include wall flanges, nuts, and washers. Handles on all faucets and stops shall be of all metal, chromium plated. Porcelain caps secured with putty shall be provided and installed for all exposed bolt heads.

E. All fixtures shall be properly and securely installed and supported as required and approved. Fixtures set against concrete walls shall be bolted thereto. Fixtures secured to partitions shall be securely bolted to the wall carrier fittings with foot supports, and shall be provided in types as required to suit the particular installation and fixture.

F. Connection between fixtures and flanges on soil pipe shall be made absolutely gas tight and water tight with graphite type gaskets (wall hung fixture) or Fedar's closet setting compound (floor outlet fixtures). Rubber gaskets, or putty will not be permitted.

G. Fixtures not having integral traps shall be provided with "P" traps of chromium plated solderless seamless brass with trap screw at bottom and connected to concealed waste in wall sanitary fittings. All trap tail pieces shall be 17 gauge minimum.

H. Unions on waste pipes on fixture side of traps may be slip or flange joints with soft rubber or lead gaskets.

I. All flush valves shall be tested and adjusted so that each fixture receives the proper amount of water. All faucets, hose bibbs, drinking fountains, etc., shall be properly regulated to the approval of the Architect.

J. Comply with State handicapped requirements regarding flow control devices, fixture mounting heights, insulation of piping under fixtures, etc.

K. Furnish and install stainless steel Hudee frames for counter mounted fixtures unless "Self-Rimming".

L. Grout all voids between fixtures and adjacent surfaces with 100% white Dow Silicon sealant.

M. All hot water fixtures to be provided with tempering valves set at 110F (unless served by main tempered water systems).

END OF SECTION

SECTION 23 01 00
OPERATION AND MAINTENANCE OF HVAC SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

1.02 ALL LEVELS OF 23 00 00.

PART 2 - PRODUCTS

2.01 OPERATION AND MAINTENANCE MANUALS

A. Form of Submittals
   1. Prepare data in form of an instructional manual for use by Owner's personnel.
      a. Cover: Identify each volume with typed or printed title, "OPERATING AND MAINTENANCE INSTRUCTION". List:
      b. Title of Project.
      c. Provide indexed tabs.
      d. Identify of separate structure as applicable.
      e. Identity of general subject matter covered in the manual.
   2. Format:
      a. PDF Format.
   3. Provide description of products and major component parts of equipment.
   4. Provide indexed tabs.

PART 3 - EXECUTION

3.01 OPERATION AND MAINTENANCE DATA

A. General: Record data and operation and maintenance data are complimentary. Submittal items which may be required under both categories may be included only under one submittal if a statement to that effect is included in the other submittal.

B. Quality Assurance
   1. Preparation of data shall be done by personnel.
      a. Trained and experienced in maintenance and operation of described products.
      b. Familiar with requirements of this Section.
      c. Skilled as technical writer to the extent required to communicate essential data.
      d. Skilled as draftsman competent to prepare required drawings.

C. Content of Manual
   1. Neatly typewritten table of contents for each volume, arranged in systematic order.
      a. A list of each product required to be included, indexed to content of the volume.
      b. List, with each product, name, address and telephone number of:
         1) Contractor
         2) Subcontractor or installer (if different than the contractor).
         3) Maintenance contractor, as appropriate.
         4) Identify area of responsibility of each.
         5) Local source of supply for parts and replacement.
      c. Identify each product by product name and other identifying symbols as set forth in Contract Documents.
   2. Product Data:
      a. Include only those sheets which are pertinent to the specific product.
      b. Annotate each sheet to:
         1) Clearly identify specific product or part installed.
         2) Clearly identify data applicable to installation.

3) Delete references to inapplicable information.

3. Drawings:
   a. Supplement product data with drawings as necessary to clearly illustrate.
      1) Relations of component parts of equipment and systems.
      2) Control and flow diagrams.
   b. Coordinate drawings with information in Project Record Documents to assure correct illustration of completed installation
   c. Do not use Project Record Documents as maintenance drawings.
4. Written text, as required to supplement product data for the particular installation.
   a. Organize in consistent format under separate headings for different procedures.
   b. Provide logical sequence of instructions for each procedure.
5. Factory Authorized Start-Up Report.
   a. Provide a factory start-up report for each piece of equipment. Contractor start-up reports, unless contractor is a factory authorized representative will not be allowed.
6. Copy of each warranty, bond and service contract issued.
   a. Provide information sheet for Owner's personnel, give:
      1) Proper procedures in event of failure.
      2) Instances which might affect validity of warranties or bonds.

D. Manual for Equipment and Systems:
   1. Submit three copies of complete manual in final form.
   2. Content, for each unit of equipment and system, as appropriate.
      a. Description of unit and component parts.
         1) Function normal operating characteristics, and limiting conditions
         2) Performance curves, engineering data and tests.
         3) Complete nomenclature and commercial number of replaceable parts.
      b. Operating procedures:
         1) Start-up, break-in, routing and normal operating instructions.
         2) Regulation, control, stopping, shut-down and emergency instructions.
         3) Summer and winter operating instructions.
         4) Special operating instructions.
      c. Maintenance Procedures:
         1) Routing operations.
         2) Guide to "trouble-shooting"
         3) Disassembly, repair and reassemble.
         4) Alignment, adjusting and checking.
      d. Servicing and lubrication schedule.
         1) List lubricants required.
      e. Manufacturer's printed operating and maintenance instructions.
      f. Description of sequence of operation by control manufacturer.
      g. Original manufacture's parts list, illustrations, assembly drawings and diagrams required for maintenance.
         1) Predicted life of parts subject to wear.
         2) Items recommended to be stocked as spare parts.
      h. As-installed control diagrams by controls manufacturer.
      i. Each contractor's coordination drawings:
         1) As-installed color-coded piping diagrams.
      j. Charts of valve tag numbers, with location and function of each valve.
      k. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.
      l. Other data as required under pertinent sections of specifications.
      m. Content for each electric and electronic system, as appropriate.
      n. Description of system and component parts.
         1) Function, normal operating characteristics, and limiting conditions.
         2) Performance curves, engineering data and tests.
         3) Complete nomenclature and commercial number of replaceable parts.

o. Circuit directories of panel boards.
   1) Electric service.
   2) Controls.
   3) Communications
p. As-installed color coded wiring diagrams.
q. Operating procedures.
   1) Routing and normal operating instructions.
   2) Sequences required.
   3) Special operating instructions.
r. Maintenance procedures.
   1) Routine operations.
   2) Guide to “trouble shooting”.
   3) Disassembly, repair and reassembly.
   4) Adjustment and checking.
s. Manufacturer’s printed operating and maintenance instructions.
t. List of original manufacturer’s spare parts, manufacturer’s current prices, and recommended quantities to be maintained in storage.
u. Other data as required under pertinent sections of specifications.
v. Additional requirements for operating and maintenance data: Respective sections of Specifications.

E. Submittal Schedule
   1. Submit two copies of preliminary draft of proposed formats and outlines of contents prior to start of work.
   2. Architect will review draft and return one copy with comments.
   3. Submit one copy of complete data in final form fifteen days prior to final inspection or acceptance.
   4. Copy will be returned after final inspection or acceptance, with comments.
   5. Submit specified number of copies of approved data in final form 10 days after final inspection or acceptance.

F. Instruction of Owner’s Personnel.
   1. Prior to final inspection or acceptance, fully instruct Owner’s designated operating and maintenance personnel in operation, adjustment and maintenance of products, equipment and systems
   2. Operating and maintenance manual shall constitute the basis of instruction.
      a. Review contents of manual with personnel in full detail to explain all aspects of operations and maintenance.

END OF SECTION

This page intentionally left blank

SECTION 23 05 00
COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The requirements of the GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS, SPECIAL CONDITIONS and DIVISION 1 GENERAL REQUIREMENTS, apply to the work of this section.

B. This section applies to all Division 23 Mechanical Sections.

1.02 SUMMARY

A. Furnish and install all mechanical work shown on the drawings, specified herein, and as required for a complete and functional installation.

B. This section includes materials and methods applicable to the work described in all Division 23 Mechanical Sections. Specific work requirements of individual Mechanical Sections take precedence if in conflict with requirements of this Section.

C. All chemicals utilized on site as part of coating, sealant, and other products shall not contain any chemical that is listed as part of Proposition 65 known carcinogens that are identified by NTP, IARC, and the USEPA California Proposition 65 chemical repository contractors are not allowed to bring these chemicals on any California Intel site.

1.03 RELATED SECTIONS

A. Division 26 - Electrical Work

B. Division 22 - Plumbing

1.04 DRAWINGS AND SPECIFICATIONS

A. For purposes of clearness and legibility, drawings are essentially diagrammatic and, although size and location of equipment are drawn to scale wherever possible, the Contractor shall make use of all data in all the contract documents and shall verify this information at building site.

B. Information presented on Drawings and in the Specifications is based upon latest data available during their preparation. The Drawings and Specifications are for the assistance and guidance of the Contractor and exact locations, distances, levels, etc. will be governed by the structures and the site the contractor shall accept same with this understanding.

C. The drawings indicate required size and points of termination of pipes, and suggest proper routes to conform to structure, avoid obstructions and preserve clearances. However, it is not intended that drawings indicate all necessary offsets, and it shall be the work of the Contractor to make the installation in such a manner as to conform to structure, avoid obstruction, preserve headroom and keep openings and passageways clear.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Contractor shall be responsible for delivery, storage, protection and placing of all equipment and materials.

B. Equipment stored and installed at the job site shall be protected from dust, water or other damage. Cover all equipment stored exposed to weather.

1.06 STRUCTURAL REQUIREMENTS

A. Structural members shall not be cut or modified in any manner without specific instructions from the structural engineer.

1.07 SEISMIC RESISTANCE

A. See Section 23 05 48.

1.08 CODES AND SAFETY ORDERS

A. All work and materials shall be in full accordance with the latest rules and regulations of the State Fire Marshall; the Safety Orders of the Division of Industrial Safety; the I.S.O. codes; the 2019 California Plumbing Code, Title 24, Part 5; the 2019 California Mechanical Code, Title 24, Part 4; the 2019 California Building Code, Title 24, Part 2, 2019 NFPA Codes, and other applicable laws and regulations. Nothing in the Drawings or Specifications shall be construed to permit work not conforming to these codes. Drawings and Specifications take precedence when work and materials called for exceed Code requirements.

1.09 INSTALLATION

A. Manufacturer's Instructions:
   1. When specifications require that installation comply with manufacturer's printed instructions, obtain and distribute copies of such instructions to parties involved in the installation.
   2. Perform work in accordance with manufacturer's instructions. Do not omit any preparatory step or installation procedure unless specifically modified or exempted by specifications.
   3. Handle, install, connect, clean, condition and adjust products in strict accordance with such instructions and in conformity with specified requirements.
   4. Should job conditions or specified requirements conflict with manufacturer's instructions, consult with the Architect for further instructions.
   5. Do not proceed with work without clear understanding.

1.10 PERMITS AND FEES

A. Obtain all permits and pay all required fees for permits and/or utility services. Inspections required during the course of construction shall be arranged as required. On completion of the work furnish the owners representative with certificates of inspection.

B. Include in bid all costs for gas service including meter, regulators and service line installed by a gas utility company or a gas utility company approved contractor.

1.11 SITE CONDITIONS

A. Assume all responsibility for damage to adjoining properties; and restore property to its original condition, should damage occur as a result of the work of this section. Contractor shall thoroughly familiarize himself with all site conditions. Should utilities not shown on the drawings be found during excavations, promptly notify the Architect for instructions as to further action. Failure to do so will make the Contractor liable for any and all damage thereto arising from his operations subsequent to discovery of such utilities not shown on plans.

1.12 SUBMITTALS

A. General
   1. A submittal schedule shall be issued by the contractor within 15 days of award of the contract. This schedule shall allow for timely review and approval as required by the contract documents.
   2. These requirements apply only to substitutions, submittals, and shop drawings.

3. The contractor shall review all submittals prior to submission to the Architect. Submittals not reviewed by the contractor will be returned to the contractor and will not be reviewed.
4. Any deviations from specified requirements shall be clearly indicated in submittals.
5. Any errors in or omissions from submittals and any consequences of these are the responsibility of the Contractor.
6. Partial or incomplete submittals may be rejected as not complying with requirements; the Contractor shall be liable for any resultant consequences.
7. Delayed submittals may be rejected as not complying with requirements. Whether accepted or rejected, delayed submittals will not be considered justification for extension of contract time or similar relief.
8. Submittals not required or permitted by the Specifications but made at the option of the Contractor, will be returned without review unless accompanied with written valid justification.
9. Submittal items improperly included with those of another category (such as a proposed substitution included with shop drawing submittal) are not valid and will be returned without review.
10. Within 35 calendar days after award of the contract, and before fabrications and installation of any material or ordering of any materials, submit for approval one copy in PDF format of complete submittal data on specified and proposed substituted equipment and materials. Submittals shall list all materials proposed identified with drawing symbols and specific data on equipment such as arrangements, performance curves, sizes, capacity, motor locations, and other pertinent data. Check all submittals for conformance to the requirements of the Construction Documents before forwarding to the architect for each item. No consideration will be given to substitutions submitted past 35 day limit. The contractor shall be responsible for all quantities and errors and omissions of submittals. Furnish samples when requested.
11. Equipment and materials specified as part of the specifications and drawings are listed by two manufacturers names. The first named manufacturer is the basis of design. The second named manufacturer has been determined to be an equivalent in quality or utility. The second named has not been specifically determined to conform to the first named in size, layout, electrical power, voltage, or impacts to building structure. The contractor is bound by all requirements for substitutes, as described below, for all second named manufacturers and equivalent equipment or products.
12. Each reviewed submittal will be marked to indicate review and directions as stated below.
13. Acceptance of a submittal does not relieve the Contractor of responsibility for omissions from the submittal or errors in the submittal.

1.13 REVIEW

A. Submittals will be reviewed for general acceptability, not necessarily including all details. The architects review is for general conformance with the design concept of the project and the information given in the contract documents. The contractor is solely responsible for confirming and correlating all quantities and dimensions; selecting fabrication processes and techniques of construction; coordinating the work and performing all work in a safe and satisfactory manner. Corrections of comments made on this submittal during this review do not relieve contractor from compliance with the requirements of the contract documents or with its responsibilities listed herein.
   1. Proposed substitutes will be judged not only for the acceptability of the items themselves, but also how they will be used under the conditions of the particular project.
   2. Proposed substitutions will be judged also for compliance with qualifications and conditions stipulated in paragraph 1.12.

B. Each reviewed submittal will be marked to indicate review and directions as stated below.
   1. Acceptance of a substitute does not waive the specified requirements.
   2. Once a substitution is accepted, no revision or resubmittal may be made except for pressing and valid reason and after receipts of approval to do so.

1.14 REVIEW DIRECTIONS

A. The notation "No Exceptions Taken" indicates that no further submittal on the particular matter is required and that the Contractor may proceed with normally ensuing action. The notation may be applied to submittals on substitutions, shop drawings, record data, or operation and maintenance data. The submittal has only been reviewed for general conformance with the design concept of the Contract Documents. The contractor is responsible for the dimensions to be confirmed and correlated at the job site; information that pertains solely to the fabrication process or to the means and methods of construction; coordination of the work; and performing all work in a safe and satisfactory manner. This notation does not modify the contractor's duty to comply with the contract documents.

B. The notation "Make Corrections Noted" indicates that no further submittal on the particular matter is required, but the Contractor shall make all changes or corrections noted (but no others) before proceeding with normally ensuing action. The notation may be applied to submittals on substitutions or shop drawings (but usually not record data or operation and maintenance data).

C. The notation "Amend and Resubmit" indicates that the submittal is not accepted and must be revised, resubmitted, and reviewed again. In the case of submittal on substitutions and shop drawings so noted, the Contractor shall not proceed with any normally ensuing action until the resubmittal is reviewed. The notation may be applied to submittals on substitutions, shop drawings, record data, or operation and maintenance data.

D. The notation "Rejected - See Remarks" indicates that the submittal is not accepted and that resubmittal on the same subject matter is not allowed and will not be considered. The notation will be applied normally only to submittals on substitutions (usually not on shop drawings, record data, or operation and maintenance data).

E. The notation "Returned Without Review" indicates that the submittal or item has not been considered officially because it is either not proper, valid, required, or permitted by the Specifications and has no status or effect.

1.15 SHOP DRAWINGS

A. The contractor is responsible for providing all shop drawings as described below so that the design professional has the opportunity to determine if the contractor understands the contract documents. It is not the purpose of shop drawings to assure that the contractor is meeting the requirements of the contract documents. Review and approval of a submittal neither extends nor alters any contractual obligation.

B. Accompany all substituted equipment with shop drawings showing revised (including as-builting of existing ductwork to remain) ductwork and/or piping layouts in order to ascertain that substituted equipment does not adversely affect layout or work. Shop Drawings: The following conditions apply to shop drawings:
   1. Shop drawings are not and do not become Contract Documents.
   2. Processed shop drawing submittals and any instructions or requirements noted thereon are a part of the work, but they may not be used as a means of increasing the scope of the work.
   3. If deviations, discrepancies, or conflicts between shop drawing submittals and the Contract Documents are discovered either prior to or after the submittals are processed, the Contract Document requirements shall govern.

1.16 SUBSTITUTIONS

A. Whenever any equipment, material, or process is indicated or specified by patent of proprietary name and/or name of Manufacturer, in the Specifications and/or on the Drawings, it is understood that such specification is used to facilitate the description of the material and/or process and deemed to be followed by the words "or equal" unless noted "no substitute".

B. Substitute equipment and materials shall be equal in all respects including quality, arrangement, utility, physical size, capacity, and performance to those specified. Approval of substitute material will not relieve the contractor from complying with the requirement of the Drawings and Specifications. The contractor shall be responsible and at his own expense, for any changes caused by proposed substitutions which affect other parts of his own work or the work of other contractors.

C. The submittal of a proposed substitution shall clearly establish the following:
   1. The item can be transported into and installed in the intended space and in the manner shown.
   2. Required connections (electrical, piping, and other) can be properly made and adjoining work can be properly accomplished.
   3. The proposed substitute is similar to and of substance equal to that specified, is suited to the same use as that specified, and will perform the functions required by the design.
   4. Motors for proposed substitute equipment will have the same minimum differential between motor brake horsepower and motor nameplate horsepower as the specified equipment.
   5. All performance requirements shall be at least equal to the specified product or equipment including noise levels, cooling capacity, heating capacity, air flow quantity, etc.

D. By submitting a proposed substitution, the Contractor agrees to the following:
   1. He will assume full responsibility for any and all modifications and necessary alterations arising from the use of the substitute item or material including all cost incurred.
   2. He will assume full responsibility for any delay in the construction schedule resulting from the use of the substitution.
   3. He will prove harmless and indemnify the Owner and the Owner's design consultants from real or alleged damages that may result from the installation, use, or performance of a substitute material or product.

E. The following conditions apply to substitutions:
   1. Submittals of substitutions are not and do not become part of the Contract Documents.
   2. Contractor shall not order, fabricate, use, or install any substitute product or procedure unless he has received acceptance of the substitute from the Architect.
   3. Should the Contractor install any substitute product in violation of the above he shall remove it and install the specified product at his own expense.
   4. The Contractor shall provide a letter stating that all the above items shall apply to all substituted products and equipment.
   5. Any submittal for substituted equipment or product that does not clearly show that the substituted item is equal shall be marked rejected and no further submittal shall be allowed on the substituted item. Provide in submittal format documentation that the proposed item is exactly as specified in the contract documents.

1.17 GUARANTEE

A. Guarantee all work for one year from date of acceptance, against all defects in material, equipment and workmanship including repair of damage to any part of the premises resulting from leaks or other defects in material, equipment and workmanship. Guarantee shall be on form supplied by the owner's representative.

1.18 RECORD DRAWINGS

A. Indicate on reproducible drawings the actual location of all ductwork, piping and equipment as the work progresses. Dimension locations of underground service mains and branches. Deliver the drawings to the architect at the completion of the job.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Shop drawings:
   1. Make all drawings to an appropriate scale, large enough to show all pertinent aspects of the item and the method of its connection into the work.
   2. Make each drawing sheet in a reproducible form such as CAD, Revit or PDF.

B. Grouping: Combine submittals in logical groupings; for example, submit Shop Drawings grouped by Sections of the Specifications, arranged in the specified sequence.

C. Shop Drawings: PDF.

D. Content:
   1. Shop drawings may be:
      a. Drawings or diagrams prepared by the Contractor, a supplier, a manufacturer, or other.
      b. Typewritten data or descriptions.
      c. Manufacturer's printed brochures, descriptions, charts, instructions, or data sheets.

E. Timing: Submit all shop drawings prior to installation of any items included in submittal.

2.02 CORROSION PROOFING

A. Corrosion Proofing / U.V. Protection: Products which will be installed outdoors, exposed to the weather, exposed to moisture, or other potentially damaging conditions shall be constructed to resist the effects of such exposure.

B. Exterior casings shall have lapped or gasketed joints effectively sealed to prevent intrusion of moisture or other injurious substances.

C. Casings, ducts, pipes, or product items shall be constructed of materials which are fully resistant to harmful substances they may normally contact, or (if ferrous) shall be galvanized after fabrication, or shall be fully protected from such substances by paint or other coating in appropriate thickness or number of coats.

D. All bolts, nuts, screws, and washers shall be galvanized unless specified to be plated or unprotected.

E. Any exposed plastic pipe must have a U.V. inhibitor.

2.03 MATERIAL AND EQUIPMENT

A. All material and equipment shall be new, of the type, capacity and quality specified and free from defects. All materials and equipment shall be of the same brand or manufacturer throughout for each class of material or equipment wherever possible.

2.04 FILTERS

A. A complete set of filters shall be supplied for use during the construction period. A complete set of new filters shall be installed before testing and balancing.

2.05 ACCESS DOORS

A. Unless specified otherwise by the Architect, provide access doors of the following type:
   1. Concealed hinges, prime coated with rust-inhibitive paint, style of door to suit wall, ceiling, floor or roof construction and fire rating.
      a. Milcor Type M
         1.) Architectural grade, one-piece frame, 16 gauge frame & door panel on concealed spring hinges, grey powder coated steel, Elmdor/Stonman or equal.

      b. Milcor Type UFR, fire resistive type Underwriters Laboratory Class B, 1-1/2 hour

rating meets UBC, IBCO and BOCA codes for two hour rated walls self latching with key lock, Elmdor/Stonman Type FR or equal.

2. Size:
   a. Minimum 12” x 12” for single valve locations and water hammer arrestor.
   b. Minimum 14" by 14" for trap primer.
   c. Minimum 18" by 18" for control valves.
3. Wall and ceiling access doors: Furnish as required for access to ducts, damper operators, duct mounted access panels, etc.; coordinate size and location to obtain access.
4. See architectural drawings for further requirements.

2.06 MISCELLANEOUS EQUIPMENT AND MATERIALS

A. Furnish and install miscellaneous equipment and materials required for the systems described whether or not specifically shown.

PART 3 - EXECUTION

3.01 PREPARATION

A. General:
   1. Do not install any equipment, valve, control, motor, filter, or any other device requiring maintenance or service in an inaccessible location or position. Install access doors as specified herein to render all such equipment serviceable whether specifically shown on the plans or not. Maintain code clearance to all equipment. Coordinate location of doors with lights, etc., and locate symmetrically with same.

B. Observations: Check all project drawings and specifications; report any discrepancies before proceeding with the work and in time to avoid unnecessary rework.

C. Investigation: Examine the areas, conditions, and status of other work contiguous or connecting to the work to be performed; ensure that the time of installation is coordinated with other work.

D. Interruptions of Service: Portions of this work may involve connection to existing work, facilities, or utilities ties and may require interrupting shutdowns of same. Carefully plan, coordinate and execute such work so that any interruptions will be kept to a minimum in time and occurrence. Submit request for shutdowns and make shutdowns only after receiving written approval from the Owner.

E. Other: Correct any unsatisfactory conditions that may impede proper execution of the work. Ensure that all arrangements, personnel, materials, and tools are appropriate and adequate before proceeding.

3.02 INSTALLATION

A. General:
   1. Material and equipment incorporated in the work shall be used or applied only for the purpose intended or specified.
   2. Install piping and ductwork and all equipment that requires access with minimum vertical and horizontal clearances required by OSHA for service.
   3. All mechanical systems such as ductwork, pipes and all other equipment shall have 2 inches minimum clearance.
   4. Do not proceed with work without clear understanding.

3.03 MANUFACTURER'S INSTRUCTIONS

A. When specifications require that installation comply with manufacturer's printed instructions, obtain and distribute copies of such instructions to parties involved in the installation.

B. Perform work in accordance with manufacturer's instructions. Do not omit any preparatory step or installation procedure unless specifically modified or exempted by specifications.

C. Handle, install, connect, clean, condition and adjust products in strict accordance with such instructions and in conformity with specified requirements.

D. Should job conditions or specified requirements conflict with manufacturer's instructions, consult with the Architect for further instructions.

E. Do not proceed with work without clear understanding.

3.04 DEMOLITION

A. General
   1. Procedures shall be determined by the contractor.
   2. Demolition work shall not be commenced until all temporary work such as fences, barricades, and any required warning lights and apparatus are furnished and installed and as required by law, regulation, or ordinance, or elsewhere in this specification.
   3. Demolition work shall proceed in such a manner as to minimize the spread of dust and flying particles and to provide safe working conditions for personnel.
   4. Fires and explosives shall not be permitted.

3.05 PROTECTION

A. Contractor shall conform to all Federal, State, and local ordinances related to the protection of the public and Contractor’s personnel and the flow of traffic. Contractor shall provide protection for persons and property throughout the progress of the work.

B. Existing work damaged by the contractor in the execution of this Contract shall be restored to former condition by the contractor to the satisfaction of the Owner without an increase in the Contract Sum and without an extension of the Contract Time.

3.06 DISPOSITION OF MATERIALS

A. All materials and equipment not scheduled to be salvaged, including debris and all rejected salvaged materials, shall become the property of the Contractor and shall be disposed of off site in a legal manner. Location of dump and length of hall shall be the contractor’s responsibility.

3.07 LOCATION OF EQUIPMENT, PIPING AND DUCT WORK

A. Where job conditions do not permit the installation of piping, ductwork, etc. in the location shown, it shall be brought to the architect's attention immediately before fabrication of ductwork, piping, etc. and the relocation required shall be determined in a joint conference.

B. The contractor will be held responsible for the relocating of any items installed without first obtaining the architect’s approval. Remove and relocate such items at the contractor’s expense as so directed by the architect.

C. Where piping or ducting is left exposed within a room, run in vertical or horizontal planes. Maintain uniform spacing between parallel lines and/or adjacent wall, floor or ceiling surfaces.

D. Horizontal runs of plumbing and/or electrical conduit suspended from ceilings shall provide for maximum clearance.

E. Make minor changes in locations of equipment, piping, ducts, etc. from locations shown including minor offsets when directed by the architect, at no additional cost to the owner.

3.08 CARE AND CLEANING

A. Clean and adjust all equipment at completion of installation to provide operating conditions satisfactory to the Architect. Remove broken, damaged or defective parts; repair or replace as directed by architect. Remove surface material and debris resulting from this work when directed.

3.09 FLASHINGS

A. Furnish and install a waterproof flashing for each pipe, duct, or other penetration through roof or wall. Flashings shall be 4 lb. seamless lead flashings Semco 1100 series with counter flashing as detailed, except in metal roofs flashing for pipes through roof shall be furnished by the roofing contractor. Where details are not specifically delineated, submit details for review.

3.10 PAINTING

A. Painting is included under the Painting and Finishing Section. It shall be the responsibility of the Contractor to properly protect all equipment and controls during painting operations and the Contractor shall repair and/or replace any item damaged due to painting that was not properly protected.

3.11 ACCESS DOORS

A. Provide access doors to all concealed equipment, valves, controls, etc. Locate doors where shown or to be coordinated and symmetrically located with lights, diffusers, etc.

3.12 ELECTRICAL REQUIREMENTS

A. Provide working space around electrical equipment in compliance with the applicable Code and all Safety Orders.

B. Coordinate the Mechanical Work with the Electrical Work to comply with the above. Furnish and set in place all motors and duct or pipe installed controls.

C. Location of all new switches shall be verified with the architect or architect before roughing-in. Furnish necessary control diagrams and instruction for the proper installation of the controls.

D. Assume responsibility for the proper supervision and testing of the controls for sequence of operation.

E. Motors and control equipment shall conform to the Standards of the National Electrical Manufacturers Association.

F. All equipment electrical characteristics shall be as noted on the drawings, or as specified. Verify before ordering any equipment.

G. Before permitting operation of any equipment which is furnished, installed or modified under this contract, review all wiring connections that pertain to mechanical equipment or work, and verify that these connections are correct.

H. Ascertain that the over-load protection devices installed are of the correct type, rating and setting to properly protect this equipment.

3.13 INSTRUCTION OF OWNER'S PERSONNEL

A. Prior to final inspection or acceptance, fully instruct Owner's designated operating and maintenance personnel in operation, adjustment and maintenance of products, equipment and systems.

B. Operating and maintenance manual shall constitute the basis of instruction.
   1. Review contents of manual with personnel in full detail to explain all aspects of operations and maintenance.

3.14 RECORD DATA

A. Compilation
   1. Record and collect information concurrently with construction progress and date all entries; make drawing entries within 24 hours after occurrence of change or installation requiring

recording. Any concealed work covered before recording data shall be uncovered as directed or as necessary to obtain data.

2. Record information on dwg file and then PDF; describe clearly by note or graphic line as appropriate.

B. Locate any concealed work adequately to allow future access with reasonable ease and accuracy.
   1. Identify the plan location of all stub outs, pipe lines, etc., which are buried or concealed in the structure, whether installed where shown on the contract drawings or in a different location; show actual field dimensions from column lines, wall lines, or other permanent reference lines or points.
   2. In many cases on the contract drawings, the arrangement of conduits, pipes, ducts, and similar items is shown schematically rather than as a precise scaled layout. Identify the actual location of these with horizontal and vertical dimensions. If such lines are exposed or readily accessible, omit dimensional identification.
   3. When any work is installed of size, dimension, slope, or location different from that shown on the contract drawings, note the deviation on the Project Record set. If the variations are substantial or cannot be shown clearly on the record drawings, make a new drawing and attach to the Record set.

C. On other documents
   1. Where changes occur in specifications, clearly indicate same in ink, colored pencil, or rubber stamp.
   2. Where installed equipment differs from that specified (e.g., by accepted substitution or change order) note in the specifications and include complete data on same.

D. The contractor shall give such notice 48 hours prior to completion of the particular phase. The purpose of notification is so that the required review can be made without delaying construction. When notified, will advise the contractor if a field review of the construction will be made in 48 hours or that a review will not be required. If the contractor fails to notify as required, and/or covers or closes in any construction before required reviews, he may be required to uncover the work for observation.

END OF SECTION

SECTION 23 05 13
COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.01 SEE SECTION 23 05 00

PART 2 - PRODUCTS

2.01 MOTOR AND STARTERS

A. Motors furnished as part of mechanical equipment shall be of size indicated and shall have starting torque sufficient to start and drive equipment load to which they are connected.

B. Electric motors shall be NEMA Premium efficiency, Gould "E 3Plus,", or equal. Provide motors with maximum efficiency and power factor at their normal load operating point.

C. Motor enclosures shall be:
   1. Open drip proof for general use.
   2. Totally enclosed for wet or exterior use.
   3. Explosion-proof for hazardous location use.

D. Electric Motors of 1/2 HP rating and over, heavy duty, ball bearing, open (drip-proof), squirrel cage induction type, normal starting torque 60 cycle service, 40o F continuous rating, and shall conform in all respects to the latest applicable standard of NEMA and AIEE. Motors up to ¾ HP rating shall have sleeve or ball bearing. Electric motors which are not housed within equipment they serve, shall be stamped for Quiet-Operation. Motors shall be of an Energy Efficient design meeting C.E.C., Title 24.

E. Motor starters and contactors except those in motor control centers shall be included in the mechanical work.

F. Starters: Starters furnished integral to, or specifically for, mechanical equipment shall be Square D, General Electric, Cutler-Hammer, or equal and shall comply with the following:
   1. Enclosures shall be NEMA Standard to suit location/duty:
      a. Type 1: general purpose.
      b. Type 3: rain tight.
      c. Type 4: watertight.
      d. Type 7&9: explosion proof.
   2. Thermal overload protection devices shall be provided as follows:
      a. One for single-phase motors.
      b. Three for three-phase motors.
      c. One for each ungrounded conductor for each winding of multi-wound or multi-speed motors.
   3. Starters for motors up to 1/3 HP may be manual type if no interlocking is required; pilot light to indicate ON position is required.
   4. Starters for motors up to 30 HP shall be magnetic across-the-line type except as stipulated above.
   5. Starters for motors over 30 HP shall be transition-type magnetic-reduced voltage unless specified otherwise. Coordinate the characteristics to ensure adequate starting torque and to limit the starting current to a level compatible to the electrical system and acceptable to the utility company/agency.
   6. Magnetic starters shall be provided with:
      a. 120 volt control circuits.
      b. H-O-A switch in cover.
      c. Auxiliary contacts for necessary interlocking.
      d. Integral disconnect switch or circuit breakers for branch circuit, short-circuit and ground-fault protection.

7. Short-circuit interrupting capacity of starters and disconnects shall be adequate for voltage employed and for current to be interrupted. This may require use of high interrupting capacity breakers or current limiting fuses. If fuses are used, provide three spares for each disconnect.
8. Starters shall be compatible with the motor they control.

PART 3 - EXECUTION

3.01 ELECTRICAL REQUIREMENTS

A. Provide working space around electrical equipment in compliance with the applicable Code and all Safety Orders.

B. Coordinate the Mechanical Work with the Electrical Work to comply with the above. Furnish and set in place all motors and duct or pipe installed controls.

C. Location of all new switches shall be verified with the architect or architect before roughing-in. Furnish necessary control diagrams and instruction for the proper installation of the controls.

D. Assume responsibility to insure that all motors are connected with flexible conduit per Division 26 requirements.

E. Assume responsibility for the proper supervision and testing of the controls for sequence of operation.

F. Motors and control equipment shall conform to the Standards of the National Electrical Manufacturers Association.

G. All equipment electrical characteristics shall be as noted on the drawings, or as specified. Verify before ordering any equipment.

H. Before permitting operation of any equipment which is furnished, installed or modified under this contract, review all wiring connections that pertain to mechanical equipment or work, and verify that these connections are correct.

I. Ascertain that the over-load protection devices installed are of the correct type, rating and setting to properly protect this equipment.

J. Where equipment motors are to be electrically interlocked with other equipment for simultaneous operation, utilize mechanical equipment wiring diagrams to coordinate with the electrical systems so that proper wiring of the equipment involved is affected.

END OF SECTION

SECTION 23 05 29
HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 SEE SECTION 23 05 00

1.02 SUBMITTALS

A. Submit proposed alternative methods of attachment for review and approval by the Architect, prior to deviating from the requirements given below.

B. For all seismic bracing systems, submit structural calculations and details prepared and signed by the Contractors licensed engineer which include all resultant forces applied to the building structure. Do not overstress building structure. The maximum allowable loads are as indicated in 3.01 of this specification. The submittal data required does not require an analysis of the building structural numbers and their reaction to the loads of the piping. The submittal data needs to address attachment methods and shall include calculations indicating the forces that are applied to the building structure at the point of attachment. Calculations will be reviewed for compliance with design criteria, not for arithmetic.

PART 2 - PRODUCTS

2.01 PIPE SUPPORTS

A. All pipes within the outer casings shall be supported at not more than 10-foot intervals. These supports shall be designed to allow for continuous airflow and drainage of the conduit in place. The straight supports shall be designed to occupy not more than 10% of the annular air space. Supports shall be of the type where insulation thermally isolates the carrier pipe from the outer conduit. The surface of the insulation shall be protected at the support by a sleeve not less than 12 inches long, fitted with traverse and, where required, rotational arresters.

2.02 HANGERS AND SUPPORTS

A. Building Attachments: Powder-actuated-type, drive-pin attachments with pullout and shear capacities appropriate for supported loads and building materials, UL listing and FM approval for fire-protection systems. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Provide beam clamp retaining straps for all pipe supports where attached to steel beams.

B. Mechanical-Anchor Fasteners: Insert-type attachments with pullout and shear capacities appropriate for supported loads and building materials.

C. Load Distribution: Install hangers and supports so piping live and dead loading and stresses from movement will not be transmitted to connected equipment.

D. B-Line, finish: Electro-Chromate or hot dipped galvanized.
   1. Pipe Straps: copper coated for copper.
   2. For insulated pipe - pipe hangers sized to allow pipe insulation to pass continuously through the hanger.
      a. Trapeze Supporting Rods: Diameter sufficient to support the load with a safety factor of 5.
      b. Isolators: Trisolator.

PART 3 - EXECUTION

3.01 PIPING HANGERS AND SUPPORTS

A. General
1. Miscellaneous: Provide all supports, anchors, concrete pads, grouting, bedding, bracing, vibration isolation, and accessories required for pumps and other equipment.
2. Support all piping with appropriate manufactured devices as specified use no wire or makeshift device.
3. The architect prior to installation shall approve all hanger material.
4. Size hanger rods, screws, bolts, nuts, etc., according to manufacturer's recommendations. Size hangers to fit around bare pipe, isolator, or insulated pipe shield as appropriate.
5. Use cadmium plated or galvanized hangers, attachments, rods, nuts, bolts and other accessories where exposed to weather. Hot dip galvanize all items which are not factory finished. Plating for hinged movements must be done at factory.
6. Hanger rods with C-clamp type structural attachment shall be equipped with retaining straps.
7. At each support on bare copper tubing or piping system, install an isolator; at each support point on insulated piping systems, install an insulated pipe shield.
8. Burning, welding, cutting, or drilling on any structural member may only be done if approved by the structural engineer.
9. No valve or piece of equipment shall be used to support the weight of any pipe.
10. Provide a hanger close to the point of change of direction of pipe run in either horizontal or vertical plane.
11. When hangers or supports do not come within one foot of a branch line fitting, install an additional hanger or support at the fitting.

B. Pipe Supports
1. Horizontal Lines
a. Suspend all horizontal pipes individually and not in contact with the structure except as specified below. Support each branch line with at least one hanger.

C. Parallel pipes may be supported on trapeze type hangers. Size trapeze hangers to support weight of piping plus a surcharge of 300 pounds. For three or more pipes use a size suitable for the load in accordance with manufacturers published load ratings. No deflection to exceed 1/180 of a span. Anchor rods securely to building structure.

3.02 LINES NEAR FLOOR

A. Support all piping near the floor individually by means of adjustable steel pipe stanchions with welded end plates properly secured to the pipe and to the floor. Alternate: Lines also near walls may be suspended as specified above for horizontal lines, from appropriately sized and mounted angle brackets.

B. Hanger Spacing Schedule:

Type of Pipe	1" dia. Or under	1¼" to 2" dia	2½" dia & over
Steel Pipe	8’-0"	10’-0"	12’-0"
Copper Tubing	6’-0"	8’-0"	10’-0"
Cast Iron	Support at 8' - 0" intervals and on each side of and within 12" of both sides of joint		

Rod Size:	3/8”	½”	5/8”	5/8”
Pipe Size	(1/2" – 2")	(2-1/2" - 5")	(6" - 8")	(over 8")

END OF SECTION

SECTION 23 05 30
HANGERS AND SUPPORTS FOR HVAC DUCTWORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The requirements of the GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS, and DIVISION 1, GENERAL REQUIREMENTS, apply to the work in this section.

1.02 SECTIONS INCLUDE

A. General: Refer to Section 23 05 00, Mechanical - General.

B. Work Included: Provide all ductwork and ductwork accessories, auxiliaries, and adjuncts for all and systems as specified or shown.

C. Work Described Elsewhere: HVAC piping, equipment, and controls are specified in other HVAC Sections.

1.03 RELATED SECTIONS

A. All Sections of Division 23.

1.04 SUBMITTALS

A. Air Balancing: Provide submittals for air balancing work as specified in Section 23 05 93 HVAC General.

PART 2 - PRODUCTS

2.01 GENERAL

A. The contractor shall provide all miscellaneous metal to bridge between structural beams to provide connection for duct supports. As an alternate ductwork may be supported from the roof deck if approved by the owner and structural engineer.

B. Rectangular Ducts (Horizontal):
   1. Up to 30" duct width: Two 1-1/2" wide 18 gauge galvanized steel straps bolted to opposite sides of duct and firmly secured to overhead construction. Each strap must also be turned and screwed to bottom of duct.
   2. 30" and greater duct width: Trapeze assembly comprised of Unistrut, Powerstrut, channel supported at each end by rod firmly secured to overhead construction; affix duct to channel with angle bracket on each side. Each strap must also be turned and screwed to bottom of duct.
      a. 30" to 72" duct width: Use Unistrut P-1000 channel or equal, size as necessary, 3/8" diameter rods.
      b. 72" to 84" duct width: Use Unistrut P-1000 channel or equal, size as necessary,1/2" diameter rods.
      c. 84" and greater duct width: Use Unistrut P-1001 channel or equal, 1/2" diameter rods.

C. Round Ducts (Horizontal):
   1. Up to 40” in diameter: One (1) 1-1/2” wide 18 gauge galvanized steel strap, firmly secured to overhead construction and extending around the entire perimeter of the duct and secured to the duct. Provide bracing to prevent duct sway as specified above for rectangular duct.

D. Vertical Ducts:
   1. Rectangular: Unistrut, Powerstrut, P-1000 channel riveted or bolted to side of duct and secured to the structure at each floor or other such level.
   2. Round: Fabricate two-piece angle iron collar, rivet or bolt to duct, secured to structure per above.

E. Structure Attachments: See Contract Documents & Specification Section 23 05 48.

PART 3 - EXECUTION

3.01 DUCTWORK SUPPORTS

A. Supports
   1. Install ductwork in accordance with applicable details, SMACNA "Guidelines for Seismic Restraints of Mechanical Systems, Latest Edition." recommendations, manufacturer's recommendations, and best practice, coordinate all ductwork support connection with the Structural Engineer.
   2. Install ducts rigidly, securely, and air tight.
   3. Support ducts independently of ductwork - connected equipment and visa-versa.
   4. Ducts shall be vibration isolated as described in 23 05 48.
   5. Penetrations:
      a. Description: All penetrations of walls separating shall have a minimum clearance of 1/2-inch and a maximum clearance of 3/4 inch.
      b. Materials: A minimum 1.5 lbs/cu.ft. fiberglass insulations shall be used and a nonhardening caulking compound.
      c. Installation: The opening around the penetration shall be filled loosely with the fiberglass insulation. The opening is then to be sealed airtight with the non-hardening caulking compound. Pipes, ducts, etc., shall be supported on either side of the wall with supports to roof structure.

END OF SECTION

SECTION 23 05 48
VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SEE SECTION 23 05 00

A. Furnish and install all systems, units, equipment, and parts to meet or exceed current applicable requirements for seismic resistance specified by codes, regulations, or agencies having jurisdiction. Include all supports, anchors, braces, and other restraining devices required. All seismic restraints and isolation shall meet Seismic requirements and are the responsibility of the contractor.

B. Design and installation of seismic bracing shall be per 2019 CBC Chapter 16.

1.2 QUALITY ASSURANCE

A. General: All isolators furnished under this Section for a given application shall be of a single manufacturer who has been regularly engaged in the design and manufacture of the equipment.

B. Manufacturers must demonstrate to the satisfaction of the Architect that the quality is equal to the equipment made by those manufacturers specifically named herein. Wherever possible, all materials and systems specified in this section shall be purchased from a single vibration isolation materials manufacturer to assure single responsibility for the performance of all isolation materials used.

C. Vibration and Noise: The completed installation must control vibration and noise to the specified limits. Systems equipment, or parts which vibrate or generate vibration unduly or which generate or emit undue noise while in operation shall: (1) be adjusted, repaired, or replaced as appropriate to obtain acceptable levels of vibration or noise, or (2) be supported on or fitted with suppression or absorption devices or means which effectively prevent the transmission of vibration or noise beyond the offending item.

1.3 SEISMIC RESISTANCE

A. Furnish and install all systems, units, equipment, and parts to meet or exceed current applicable requirements for seismic resistance specified by codes, regulations, or agencies having jurisdiction. Include all supports, anchors, braces and other restraining devices required. All seismic restraints will meet the following site specific seismic design criteria:
   1. Seismic Design Category D, 2) Importance Factor, Ip = 1.0 and 3) SDS = 0.490
   2. Seismic restraints are the responsibility of the contractor.

B. Design of seismic bracing shall meet requirements of 2019 CBC Chapter 16A.

1.4 SUBMITTALS

A. Manufacturer's Data:
   1. Provide materials lists, catalog data sheets, manufacturer's drawings and technical literature covering details of all equipment or items specified or shown on drawings.
   2. For Metal Spring Isolators provide the following as a minimum:
      a. Spring diameter.
      b. Static deflection.
      c. Compressed spring height.
      d. Solid spring height.
      e. Number of active coils.

f. Ratio of horizontal to vertical stiffness.
g. Operating height.
h. Spring constant.
i. Vertical load for each spring.
j. Location and designation of each isolator.
k. Calculate horizontal and vertical loading and bending moment due to a horizontal force applied at the center of the gravity of the isolated equipment. Calculate bolt requirements.
l. Indicate all bases and rail clearance of one inch.

B. Shop Drawings:
1. Submit plans, elevations and sections and details showing installation, operating heights and spring constants, stamped and signed by a registered structural engineer.

C. Static seismic calculations for all equipment, piping and miscellaneous structural steel connections to building frame.
1. Calculations shall be performed by a California licensed structural engineer employed by the isolation manufacturer for a minimum of five years.

D. Certification of Seismic restraints include details of materials or methods which depart widely from those specified.

E. All mechanical equipment shall be anchored or braced to meet the horizontal and vertical forces prescribed in 2019 CBC.

F. The attachment of the following items shall be designed to resist the forces prescribed in Section 1613A, but need not be detailed on the plans:

G. Equipment weighing less than 400 pounds supported directly on the floor or roof.

H. Furniture required to be attached in accordance with Part 2, Title 24, C.C.R..

I. Temporary or movable equipment.

J. Equipment weighing less than 20 pounds supported by vibration isolators.

K. Equipment weighing less than 20 pounds suspended from a roof or floor or hung from a wall.

L. For those elements that do not require details on the approved drawings, the installation shall be subject to the approval of the Mechanical Engineer and the field representative of the Division of the State Architect.

M. The bracing and attachments to the structure shall comply with one of the OSHPD Pre-Approvals with an OPM #, such as Mason Industries.

N. Copies of the manual shall be on the jobsite prior starting hanging and bracing of the pipe and ductwork systems.

O. The structural engineer shall verify the adequacy of the structure to support the hanger and brace loads.

PART 2 - PRODUCTS

2.1 SPRING HANGERS (SH)

1. Combination Coil-Spring and Elastomeric-Insert Hanger with Spring and Insert in Compression: .Acceptable manufacturers include but are not limited to the following:
   a. Mason Industries, Inc. - Type 30
   b. Kinetics Noise Control, Inc. – Type SRH
   c. Vibration Mountings & Controls – TYPE HSA
2. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
7. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
8. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.

2.2 RESTRAINED SPRING CURB (RSC)

1. Acceptable manufacturers include but are not limited to the following:
   a. Mason Industries, Inc. – Type RSC
   b. Or approved equal.
   c. Curb must be Pre-Approved per OPA-0207

B. Description: Factory-assembled, fully enclosed, insulated, air- and watertight curb rail designed to resiliently support equipment.

C. Upper Frame: Upper frame shall provide continuous and captive support for equipment.

D. Lower Support Assembly: The lower support assembly shall be formed sheet metal section containing adjustable and removable steel springs that support upper frame. Springs to have a 3” deflection and 50% additional travel to solid. Spring diameters no less than 0.8 of the spring height at rated load. All spring locations shall have access ports with removable waterproof covers. The lower support assembly shall have a means for attaching to building structure and a wood nailer for attaching roof materials and shall be insulated with a minimum of 2 inches of rigid glass-fiber insulation on inside of assembly. Adjustable, restrained-spring isolators shall be mounted on elastomeric vibration isolation pads and shall have access ports, for level adjustment, with removable waterproof covers at all isolator locations. Isolators shall be located so they are accessible for adjustment at any time during the life of the installation without interfering with the integrity of the roof.

E. Snubber Bushings: All-directional, elastomeric snubber bushings at least 1/4 inch thick.

F. Water Seal: Galvanized sheet metal with EPDM seals at corners, attached to upper support frame, extending down past wood nailer of lower support assembly, and counterflashed over roof materials.

2.3 VIBRATION ISOLATION SCHEDULE

Equipment	Unit(s)	Design Deflection	Isolator
AC/AHU Units		2”	NCC – internal isolation to be disabled
Fan Coil Units		1.0”	SH
GENERAL VIBRATION ISOLATION REQUIREMENTS			
Incorporate a water hammer arrestor on connections to equipment using a quick closing valve.			
Flexible conduits at connections to motors and other vibrating equipment.			
Provide suitable flexible piping at connections to vibration isolated equipment such that vibration isolator efficiency is not reduced.			
Use resilient elements at all support points where permitted. Where permitted, make no rigid connections between equipment, piping, and the building structure which would degrade the noise and vibration isolation system.			
PLUMBING LINES VIBRATION ISOLATION SCHEDULE			
Riser Support		0.06” deflection	Type EIP
Miscellaneous Attachments		Type T	
		Deflection equal to connected equipment isolator	
Horizontal Piping – subsequent support points		Deflection equal to ½ that of connected equipment isolator – min 0.75”	Type SH

PART 3 - EXECUTION

3.1 GENERAL

A. Specific application of products shall be as delineated in this and other Sections of the Division.

B. Installation of all vibration isolation materials, spring and equipment bases specified in this section of the specifications shall be accomplished following the manufacturer's written instructions.

C. Additional installation instructions may be specified in other Sections of the Division.

D. The isolation materials manufacturer shall be responsible for the proper selection of spring rates to accomplish the specified minimum static deflections, for all spring and pad type isolators, based on the weight distribution of equipment to be isolated.

E. The isolation materials manufacturer shall be responsible for the structural design of steel beam bases, to support mechanical equipment scheduled to receive a supplementary base.

3.2 INSTALLATION OF ISOLATORS, BASES AND SEISMIC RESTRAINTS

A. General
   1. Isolators shall be installed and loaded per the requirements of the manufacturer except as otherwise indicated.
   2. All vibration isolators for a single piece of equipment shall be installed to provide equal deflection and load.
      a. Adjust leveling devices as required to distribute loading uniformly onto isolators.
      b. Shim units as required where leveling devices cannot be used to distribute loading properly.
      c. Adjust to ensure that units do not exceed rated operating deflections or bottom out under loading and are not short-circuited by other contacts or bearing points.
      d. Remove space blocks and similar devices (if any) intended for temporary protection against overloading during installation.
   3. Locate isolation hangers as near the overhead support structure as possible.
   4. All connections to vibration isolated equipment shall be through flexible connections. This shall include all piping, electrical connections, fuel lines, structural elements, etc.
   5. Equipment installed on metal spring isolators shall rock freely or move freely within limits of stop or seismic snubber restraints.

B. Hanger Spring Isolators
   1. Hanger isolators shall be used on all main supply and return ducts supported from the deck above when within 50 feet of initial drop from the equipment.
   2. Hanger isolators shall be used on all horizontal piping supported from the deck above when within 50 feet of initial drop from the equipment.
   3. Hanger spring isolators shall be hung plumb to reduce chance of rod contacting spring housing. Check that spring or rod do not contact hanger housing after installation.
   4. Attach seismic cables per SMACNA and CBC requirements.
   5. After installation, confirm that unit can move or rock freely on spring.
   6. Ensure that there is additional travel to full compression or to solid equal after spring is loaded.

   7. Confirm the operating height is per manufacturer's submittal and that minimum static deflection is per specifications.

C. Spring Isolators
   1. Place spring under hole in equipment base and check to see if supports are badly off level. If so, shim mounting level before securing spring to base.
   2. Adjust leveling bolts until the load distribution between springs is correct as denoted by whether spring is free and at operating height.
   3. After installation, confirm that unit can move or rock freely on spring.
   4. Ensure that there is additional travel to full compression or to solid after spring is loaded.
   5. Confirm the operating height is per manufacturer's submittal and that minimum static deflection is per specifications.
   6. Ensure that seismic system selected for the specific equipment or building element is installed per SMACNA and CBC requirements.

D. Spring Isolator Curb
   1. All roof top units shall be installed on combination roof curb/spring isolator.
   2. Install spring isolator curbs strictly in conformance with the instructions provided by the manufacturer.
   3. After removing cover plates, release spring lock downs.
   4. Adjust leveling bolts until the load distribution between springs is correct as denoted by whether spring is free and at operating height.

5. After installation, confirm that unit can move or rock freely on spring.

3.3 FLEXIBLE CONNECTOR INSTALLATION

A. Duct Flexible Connectors
   1. Provide at inlet and outlet of each supply and return fan and as shown on drawings.
   2. Allow one inch (1") minimum free space between metal collars each side of fabric.
   3. Connection shall be nominal six inches (6") wide with material taunt.

END OF SECTION

SECTION 23 05 53
IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SEE SECTION 23 05 00

PART 2 - PRODUCTS

2.1 IDENTIFICATION

A. Equipment: Black Phenolic Plates engraved with 1/2" high white letters. The equipment shall be identified by the mechanical equipment schedule tag numbers shown on the plans (ie. AC-1, REF-1, ACCU-1). Coordinate identification numbers to ensure that the disconnect switches and other electrical/mechanical equipment has consistent identification numbers.

B. Controls: Same as equipment above except 1/2" high letters.

2.2 PIPE IDENTIFICATION

A. Maximum spacing for identification shall be 10 feet.

B. Identification shall be provided per the following
   1. At both sides of floor or wall penetrations
   2. Adjacent to all valves and flanges
   3. Adjacent to all changes in direction
   4. To be visible from the point of normal approach

C. Indicate flow direction and type of fluid.

D. Provide plastic labels for mechanical engraving with predrilled holes for attachment hardware.
   1. Material: rigid plastic laminated impact acrylic, 2-layer, exterior grade, UV stable.
   2. Thickness: 3/16 inch minimum.
   3. Maximum label size: Length and width vary for required label content but, no less than 2 inches wide by 1 inch high.
   4. Background color:
   5. Normal power: Black, matte finish.
   6. Lettering: White, machine engraved, Futura font, 3/8 inch high, all caps.
   7. Maximum temperature: Able to withstand up to 160 degrees Fahrenheit.
   8. Fasteners: Self-tapping stainless-steel screws, except contact type permanent adhesive where screws cannot or should not penetrate substrate.
   a. Mounting screw type to be number 8 – 18 by ½ drilling or tapping style, ¼ inch hex washer head, stainless steel, or similar, appropriate for material in which sign is affixed to. A bead of silicone sealer shall be applied on back of sign and at screw locations prior to affixing sign to equipment.
   b. For signs larger than 3 inches by 3 inches, use a minimum of 4 mounting screws.

2.3 PAINTED IDENTIFICATION MATERIALS

A. Stencils: Standard fiberboard stencils, prepared for required applications with the letter sizes generally complying with recommendations of ANSI A13.1 for piping and similar applications but, not less than ¾ inch high letters for access door signs and similar operational instructions.

B. Stencil paint: Standard exterior type stenciling enamel; black, except as otherwise indicated; either brushing grade or pressurized spray can form and grade.

C. Identification paint: Standard identification enamel of colors indicated or, if not otherwise indicated for piping systems, comply with ANSI A13.1 for colors.

2.4 PIPE IDENTIFICATION

A. General requirements for Manufactured Pipe labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Self-adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing. Brady/Seton, Stranco, Rowmark or equal.

C. Small pipes: For external diameters less than 6 inches, provide full-band pipe markers, extending 360 degrees around the pipe at each location, fastened by one of the following methods:
   1. Snap-on application of pre-tensioned semi-rigid plastic pipe marker.
   2. Adhesive lap joint in pipe marker overlap.
   3. Laminated or bonded application of pipe marker to pipe (or insulation).
   4. Taped to pipe (or insulation) with color-coded plastic adhesive tape, not less than 3/4 inch wide; full circle at both ends of pipe marker, tape lapped 1-1/2 inches.
   5. Pipe label contents: Include identification of piping service using piping system nomenclature as specified, schedules or shown, and abbreviate only as necessary for each application. Include pipe size and an arrow indicating direction of flow.
   6. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
   7. Lettering Size: At least 1-1/2 inches high.

D. Locate pipe markers as follows:
   1. Within one foot of each valve, fitting, thermometer or gauge.
   2. At each branch or riser take off.
   3. At each passage through walls or ceiling construction.
   4. At each passage to underground.
   5. On all horizontal pipe runs every 20 feet, at least twice in each room.
   6. Identify piping contents, flow direction, supply and return.
   7. At wall and ceiling access panels.
   8. Practible variations or changes in locations and spacing may be made with specific approval of the University’s Representive to meet specific conditions.

A. Color code shall be as follows:

   1. Natural Gas - Yellow Background with Black Lettering
   2. Refrigerant Piping - Yellow Background with Black Lettering

B. Pipe Letter height shall be as follows:

Outside Pipe Diameter Including Insulation	Minimum Length of Label	Minimum Height of Letters
.75” – 1.25”	8”	.5”
1.5” – 2”	8”	.75”
2.5” – 6”	12”	1.25”
8” – 10”	24”	2.5”
Over 10”	32”	3.5”

PART 3 - EXECUTION

3.1 EQUIPMENT AND CONTROL IDENTIFICATION

A. Identify all equipment with permanently attached plates.

B. Identify all controls and controllers except thermostats in finished areas.

3.2 IDENTIFICATION APPLICATIONS

A. Piping and Valves
   1. Provide identifications for all valves. Provide tags with lettered inscriptions (not numbered).

END OF SECTION

This page intentionally left blank

SECTION 23 05 93
TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.01 SEE SECTION 23 05 00

A. Work Included: This Section describes balancing requirements for all phases of HVAC work. The work includes complete balancing, adjusting and testing of the air and hydronic equipment and systems.

1.02 QUALITY ASSURANCE

A. Testing and Balancing shall be performed in complete accordance with AABC National Standards for Field Measurement and Instrumentation only by an AABC or NEBB licensed contractor.

B. Work shall be performed by an independent test and balance agency that specializes in, and whose business is limited to testing and balancing of air conditioning systems.

C. Instruments used for testing and balancing of systems shall have been calibrated within a period of six (6) months and shall be checked for accuracy prior to start of work.

D. Contractor is responsible for balance the entire system, including existing and new balance dampers.

1.03 SUBMITTALS

A. Provide to the Owner and Contractor with four (4) copies of a balancing agenda prior to start of balancing work including:
   1. General description of each air system with its associate equipment and operational cycles for winter heating, reheat, humidification, and cooling. Where different cycles are used for day and night time operation, describe separately.
   2. A complete list of all flow and terminal measurements to be performed.
   3. Agenda shall also include specific procedures for determining test parameters for flow. Specify type of instruments to be used, method of instrument application and air terminal correction factors for:
      a. Air terminal configuration.
      b. Flow direction (supply, return, or exhaust).
      c. Effective area application to each size and type of air terminal.
      d. Density corrections.
   4. Furnish a copy of agenda to the Architect and Owner prior to start of work, including qualifications of key personnel assigned to the project.

B. Provide four (4) copies of final report, (two to the Owner and two to the Contractor) containing information outlined in AABC and in Part 3 - EXECUTION.

1.04 NOTIFICATION AND SCHEDULING

A. A pre-balance conference shall be held prior to start as scheduled by the Contractor. Attendees at the meeting shall include representatives of the Balancing Contractor, General Contractor, Mechanical Sub-contractor, Control Sub-contractor, and Owner.

B. The schedule for testing and balancing the HVAC system shall be established in coordination with the Balancing Contractor on a critical path network.

C. The Balancing Contractor is responsible for initiating this continuing coordination to determine schedule for final testing and balancing services.

1.05 COORDINATION

A. To bring the HVAC system into a state of readiness for testing, adjusting and balancing, the Contractor shall perform the following:
   1. Ensure that all splitters, extractor, volume, smoke and fire dampers are properly located and functional. Dampers serving requirements of smoke, minimum and maximum outside, return, relief, and exhaust air shall provide tight closure and full opening, with a smooth and free operation.
   2. Verify that all supply, return, exhaust, and grilles, registers, diffusers and terminal units are installed and operational.
   3. Ensure that air handling or conditioning systems, units, and associated apparatus, such as heating and cooling coils, filter sections, access doors, etc., are blanked and/or sealed to eliminate excessive bypass or leakage of air. All fans and systems (supply, return, relief, and exhaust) are operating and free of vibration.

PART 2 - PRODUCTS

2.01 INSTRUMENT AND TOOLS

A. Furnish all instrumentation and tools required to perform a complete air balance of all systems on this project.

2.02 FLOW METERING SYSTEM

A. Use flow metering systems specified and/or furnished to perform air balance.

PART 3 - EXECUTION

3.01 GENERAL

A. Coordinate required locations of duct test openings and damper locations specified in other sections.

B. Coordinate work done by testing and balancing agency.

C. Plan Check and Review
   1. Review location and type of volume dampers inlet conditions to air terminals, valves and HVAC equipment.
   2. Review automatic control systems as they affect the test and balance procedure.
   3. Review sheet metal and piping shop drawings to verify the installation of flow control devices.

D. Job Site Inspections
   1. Check for necessary balancing hardware (dampers, flow meters, valves, pressure taps, thermometer wells, etc.) to determine if they are installed properly and readily accessible.
   2. Identify and report possible restrictions in systems (closed smoke/fire dampers, fire dampers, long runs of flexible duct, poorly installed duct fittings.
   3. The Contractor shall make any changes in pulley, sheaves; supply new pulleys, sheaves, belts as required. In addition, Contractor to add dampers, etc. Necessary for correct balance at no additional cost to the Owner.
   4. Check for necessary balancing hardware (dampers, flow meters, valves, pressure taps, thermometer wells, etc.) to determine if they are installed properly and readily accessible.

E. Identify and report possible restrictions in systems (closed smoke/fire dampers, fire dampers, long runs of flexible duct, poorly installed duct fittings.

3.02 TESTING

A. Testing equipment shall be furnished by the contractor; testing personnel shall be competent to conduct the tests.

B. Test all ductwork for excessive leakage and/or noise. Testing on any completed section of the ductwork must be made before installation of the finished ceiling or before the ductwork is furred in inaccessible spaces. Any leaks found must be properly repaired or joints remade and the section retested until tight. Any leaks which cause an objectionable noise must be repaired, regardless of the amount of leakage.

C. Should any piece of an apparatus or any material or work fail in any of the tests, it shall be immediately removed and replaced by new material, and portion of the work replaced shall again be tested by Contractor at his own expense.

3.03 OPERATIONAL TESTS AND ADJUSTMENTS

A. Upon completion of the work, all equipment and systems shall be operated and tested for a period of at least three consecutive days to demonstrate their satisfactory overall operation. On the last day of this period, the Contractors shall arrange for an acceptance test and final inspection by the Owner. All necessary adjustments and corrections to the systems shall be made prior to acceptance test so that the systems are operating smoothly and properly and absolutely ready before check and acceptance.

B. Coordination of all items associated with the mechanical systems is the responsibility of the contractor, including all wiring in connection with mechanical equipment, and all temperature control work. It shall be the contractor's responsibility to determine that his systems, equipment and apparatus are properly wired and controlled and completely ready for satisfactory operation and test.

C. Immediately before starting tests, all air filters shall be replaced as hereinbefore specified. All motors checked for rotation and all bearings lubricated.

D. Operating and safety controls shall be tested at least three times, under ambient design conditions.

3.04 AIR BALANCE

A. Changes, additions and modifications to dampers, pulleys and/or drive belts and other equipment necessary for proper air balance shall be provided by the Contractor at no additional cost to the Owner.

B. The Contractor shall retain the services of an independent certified test and balance agency to provide a complete air balance. All work shall be done by using instruments certified accurate to limits used in standard practice for testing and balancing of air distribution for heating-cooling systems.

C. Study design specifications and engineering drawings and prepare schedule to physically inspect mechanical equipment for air distribution systems to be tested and balanced.

D. Prepare test and balancing schedule, test record forms and necessary technical information about the air distribution systems for installed heating-cooling equipment, and fan systems, for complete total air balance.

E. Recommend adjustments and/or corrections to mechanical equipment and air distribution systems that are necessary for proper balancing of air handling systems.

F. Upon completion of the air handling system, the Air Balance Agency shall complete tests, analysis and balance of the air handling systems for heating-cooling equipment. The Air-Balance Agency then shall submit four copies of balance report for forwarding to the Architect for evaluation and approval.

G. Air Balance Report shall include the following data
   1. Design specifications of air handling equipment
      a. CFM
      b. Static Pressure
      c. % of Outside Air
      d. Fan Motor HP
      e. Fan Motor BHP
      f. Fan RPM
   2. Installed equipment data
      a. Manufacturer
      b. Identifying Data
   3. Balancing test data
      a. Fan Speed
      b. Fan Operating amperes
      c. Fan Operating BHP
      d. Fan Duct sizes
      e. Air Velocity (avg.)
      f. Total CFM
      g. Static Pressures
      h. Design Specifications of grilles and/or diffusers
      i. Manufacturer No. and Data
      j. FPM
      k. CFM
   4. Installed equipment data
      a. Manufacturer No. and Data
      b. Location
   5. Balancing test data
      a. FPM
      b. CFM

H. All outlets shall be set for the air pattern shown on plans.

I. Supply and return air dampers shall be set for design CFM, on heating and cooling cycle.

J. Test and balance shall correct for air density at 6000 ft. elevation and above.

3.05 BALANCING PROCEDURE FOR VARIABLE AIR VOLUME SYSTEMS

A. **Compensating for Diversity**: When the total airflow of all terminal units is more than the indicated airflow of the fan, place a selected number of terminal units at minimum set-point airflow with the remainder at maximum-airflow condition until the total airflow of the terminal units equals the indicated airflow of the fan. Select the reduced-airflow terminal units so they are distributed evenly among the branch ducts.

3.06 MOTOR AND STARTERS

1. Measure the ampere reading of each motor input after final adjustments have been made. Measure the ampere reading of each electrical heater input after final adjustments have been made.
2. Tabulate magnetic starters size, type and manufacturer with heater strip size and type for starters not in motor control centers.

3.07 OWNERS INSTRUCTION

A. Review the installation of all equipment and controls with the Owner after all systems are operating automatically. Instruct the Owner in the adjustment of all control and equipment devices. Allow a minimum of 4 hours for this instruction.

END OF SECTION

SECTION 23 07 00
HVAC INSULATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The requirements of the GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS, and DIVISION 1, GENERAL REQUIREMENTS, apply to the work in this section.

B. See 23 05 00

1.02 SECTIONS INCLUDE

A. This Section describes insulation materials, methods, and applications for HVAC Mechanical Work, Special or specific details, applications, features, or methods may be described in work descriptions Sections or on the drawings.

1.03 REFERENCES

A. Thermal insulation materials shall meet the property requirements of one or more of the following specifications as applicable to the specific product or end use:
   1. American Society for Testing of Materials Specifications:
      a. ASTM C 547, "Standard Specification for Mineral Fiber Pipe Insulation"
      b. ASTM C 585, "Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System)"
      c. ASTM C 1136, "Standard Specification for Flexible, Low Permeanace Vapor Retarders for Thermal Insulation"

1.04 SYSTEM PERFORMANCE

A. Insulation materials furnished should meet the minimum thickness requirements of National Voluntary Consensus Standard 90.1 (Latest edition), "Energy Efficient Design of New Buildings," of the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE).

B. Insulation materials furnished and installed hereunder shall meet the fire hazard requirements of applicable building codes when tested in composite form per one of the following nominally equivalent test methods:
   1. American Society for Testing of Materials ASTM E 84
   2. Underwriters' Laboratories, Inc. UL 723, CAN/ULC-S102-M88
   3. National Fire Protection Association NFPA 255

C. Molded pipe insulation shall be manufactured to meet ASTM C 585 for sizes required in the particular system.

D. Molded fibrous glass pipe insulation shall comply with the requirements of ASTM C 547.

1.05 QUALITY ASSURANCE

A. Qualifications of Installers: only a licensed firm employing installers specifically skilled and experienced in applying insulation to piping shall do Insulation work.

B. Insulation materials and accessories furnished and installed hereunder shall, where required, be accompanied by manufacturers' current submittal or data sheets showing compliance with applicable specifications listed in above.

C. Insulation materials, including all weather and vapor barrier materials, closures, hangers, supports, fitting covers, and other accessories, shall be furnished and installed in strict accordance with project drawings, plans, and specifications.

D. Insulation materials and accessories shall be installed in a workmanlike manner by skilled and experienced workers who are regularly engaged in commercial insulation work.

E. Codes and Standards:
   1. California Code of Regulations - Title 24.
   2. National Fire Protection Association - 90A.

1.06 DELIVERY AND STORAGE OF MATERIALS

A. All of the insulation materials and accessories covered by this specification shall be delivered to the job site and stored in a safe, dry place with appropriate labels and/or other product identification.

B. The contractor shall use whatever means are necessary to protect the insulation materials and accessories before, during, and after installation. No insulation material shall be installed that has become damaged in any way.

C. If any insulation material has become wet because of transit or job site exposure to moisture or water, the contractor shall not install such material, and shall remove it from the job site. An exception may be allowed in cases where the contractor is able to demonstrate that wet insulation when fully dried out (either before installation or afterward following exposure to system operating temperatures) will provide installed performance that is equivalent in all respects to new, completely dry insulation. In such cases, consult the insulation manufacturer for technical assistance.

PART 2 - PRODUCTS

2.01 DUCT INSULATION – SEE 23 07 13

2.02 HVAC EQUIPMENT INSULATION – SEE 23 07 16

2.03 HVAC PIPING INSULATION – SEE 23 07 19

PART 3 - EXECUTION

3.01 APPLICATION / INSTALLATION

A. Use the types and thickness of insulation specified in work description Sections.

B. Apply insulations in accordance with the manufacturer's recommendations and with instructions specified herein or noted on the drawings.

C. Install insulations only after the systems, items, and equipment have been installed and tested, inspected, and accepted. Exceptions: Slip-on piping insulation and equipment insulations installed at the factory.

D. Fit insulation snugly to the item being insulated; butt all joints tightly with no voids, spaces, or thin spots.

E. Seal all joints completely; where sealing tape is used, center the tape over the joint.

F. Except where specified or necessary, do not use staples or fasteners which penetrate vapor barrier jackets or covers on cold systems or equipment; where such penetrating fasteners are used, seal each penetration completely to maintain the vapor barrier integrity. All penetrations of the ASJ and exposed ends of insulation shall be sealed with vapor barrier mastic. Vapor seals at butt joints shall be applied at every fourth pipe section joint and at each fitting to provide isolation of water incursion.

G. Use adhesives, mastics, cements, sealants, and finishes undiluted unless specifically directed otherwise; apply per manufacturer's directions.

H. Install outdoor jacketing or other specified weather proofing or finishing on all insulations outdoors.

I. Install all indoor exposed insulation with extra care and finish neatly.

J. Follow specified methods of installation unless alternative methods are submitted and approved.

3.02 FINISHING

A. Finishes and Protection:
   1. Insure that the exterior finish of all insulation is applied and complete as specified
   2. Make ready for painting, or painted to match existing including color where specified for paint.
   3. Install all metal jackets or protective sheathing where specified.

B. Repair, Touchup: Properly repair and touchup all dents, rips, tears, or other damage inflicted on jackets or exterior surfaces of insulation. Breaks or punctures in the vapor barrier of external insulation will not be accepted and must be repaired prior to project acceptance.

END OF SECTION

This page intentionally left blank

SECTION 23 07 13
DUCT INSULATION

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. See Section 23 07 00

B. A continuous, intact vapor barrier is critical for ducts.

C. All insulation material shall have a mold, humidity, and erosion resistant face that has met the requirements of CMC Table 1701.

D. Insulation applied to the exterior surface of ducts located in buildings shall have a flame spread of no more than 25 and a smoke developed rating of not more than 50.

E. Insulate all above grade ductwork unless otherwise shown on the drawings or specified in Section 23 31 16 METAL DUCT.

PART 2 - PRODUCTS

2.01 ID-1 FLEXIBLE BLANKET/VAPOR BARRIER FACED

A. Glass fiber reinforced Kraft/aluminum foil faced flexible blanket of 1.5 PCF nominal density resin bonded fibrous glass, have a installed thermal conductivity k factor of 0.25 at 75° F.; suitable for direct application and service on cold and dual temperature ductwork.

B. Supply FSK jacket with a permeance of 0.02 or less

C. Fiberglass insulation with all service facing, Certainteed Type 150 with Type IV facing, Johns Manville Microlite with FSK facing.

PART 3 - EXECUTION

3.01 APPLICATIONS

A. Supply Air Ducts indoors/concealed
   1. Use System ID-1 (Flexible Blanket / Vapor Barrier Faced
      a. 2” thickness for all sizes; installed R-value = 6.3 minimum
      b. Applies to all cross sections (I.E. rectangular, circular, etc.)

B. Supply/Return Air Ducts Outdoors (See Duct Liner Specification)
   1. 2” thickness for all sizes; See Duct Liner for R-value.
   2. Applies to all cross sections (I.E. rectangular, circular, etc.)

C. Return Air Ducts indoors/concealed
   1. Use System ID-1 (Flexible Blanket / Vapor Barrier Faced
      a. 1 ½" thickness for all sizes; installed R-value = 4.7 minimum.
      b. Applies to all cross sections (I.E. rectangular, circular, etc.)

D. Do not externally insulate the following unless otherwise shown on the drawings or specified:
   1. Lined ductwork (indoors).
   2. Ducts constructed of fibrous glass (flexible or rigid).
   3. Above grade ducts conducting exhaust air or ventilating air (not heated or cooled and used for fresh air supply) unless otherwise noted.
   4. Exposed ducts located in conditioned space.

3.02 INSTALLATION FLEXIBLE BLANKET/VAPOR BARRIER FACED

A. Install on supply and return ductwork so that condensation will not occur.

B. Wrap around ducts, butt all joints. Secure with 3” (minimum) width tape at 18" (maximum) intervals along the duct; tape may be of the same material as the insulation facing with a pressure sensitive adhesive on one side or may be Hardcast DT490-C mineral impregnated woven synthetic fiber using Hardcast FTA-20 roller. In addition, on rectangular and cross section ducts, secure to the flat bottoms more than 18" wide with SticKlip fasteners only with 1 ½" diameter washers at 16" centers both ways; one centered longitudinal row is sufficient for ducts up to 36" flat bottom width.

C. Seal all seams and joints with 3" (minimum) width tape centered along the edge of the lap;tape shall be as specified above.

D. Seal all fastener penetrations with 3" x 3" (minimum) tape centered over the washer; tape shall be as specified above.

E. Where strap type duct supports penetrate the insulation, slit the insulation and facing, fit around the straps, and seal with tape as specified above; tape shall be of size to suit the situation and be applied in the number of layers necessary to obtain complete sealing.

F. For low temperature air ductwork, insulate the straps a minimum of 4 inches from any point of contact with the duct.

G. At trapeze or similar type duct supports, insert a 12" wide strip of Armaflex insulation, ½" thick between duct bottom and the supporting member across and 6" beyond both ends of the bearing surface. Lap ducts insulation over this insert and seal the same as other lapped seams.

H. Insulate all flexible duct connectors to the same thickness as adjacent duct insulation.

I. Continue insulation on terminal unit inlets to cover the entire inlet collar.

J. Insulate over all duct access doors with the same thickness as adjacent duct insulation. Provide removable insulation piece with an outer label on the insulation identifying the type of door.

K. Outdoors, provide additional seal over all joints and fastener or other penetrations by covering same 2" beyond tape sealing (above) with two (2) coats of Fosters 30-65 or Childers CP-34 vapor barrier coating reinforced with Fosters Mast a Fab or Childers Chil Glas #10 reinforced mesh. Vapor barrier coating shall have a permeance of 0.03 perms or lass at 45 mils as tested by ASTM E96, procedure A.

L. Finish all outdoor ductwork insulation by applying two (2) 1/8" thick coats of Foster 46-50 or Childers CP-10/11 weather barrier mastic reinforced with Fosters Mast a Fab or Childers Chil Glas #10 reinforced mesh. Vapor barrier coating shall have a permeance of 0.03 perms or lass at 45 mils as tested by ASTM E96, procedure A. Lap all joints 2".

3.03 INSTALLATION: FLEXIBLE BLANKET/COATED LINER

A. Apply a 1/16" thick coat of Foster 85-62 JacTac 3-M Company Scotch Grip #38, Childers-125-1, adhesive or duct butter on all end or edges of cuts, rips, etc., before or while installing.

B. Secure to the ductwork with welded or SticKlip, fasteners with 1 ½" diameter washers with cupped or beveled heads. Set at 16 (maximum) on centers both ways; provide a row of pins within 1" of all edges and joints, and one row of pins (minimum) on each flat duct or plenum face. In addition secure the entire perimeter of all edges at seams or joints with a 4" minimum width application of the above specified adhesive. The upstream edge of all duct liner shall have a sheet metal closure to protect against erosion.

C. Fasteners shall compress the liner no more than 1/8”.

D. Clip off protruding ends of fastener pins in plenums.

END OF SECTION

This page intentionally left blank

SECTION 23 07 19
HVAC PIPING INSULATION

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

1.02 SEE SECTION 23 07 00.

A. A continuous, intact vapor barrier is critical for all pipes conveying fluids at temperatures less than 75° F.

B. All insulation material shall have a mold, humidity, and erosion resistant face that has met the requirements of CMC Table 1701.

C. Insulation applied to the exterior surface of pipes located in buildings shall have a flame spread of no more than 25 and a smoke developed rating of not more than 50.

D. All requirements of Section 23 07 00 apply to this section.

PART 2 - PRODUCTS

2.01 IP-1 RIGID MOLDED SECTIONAL.INDOOR CONCEALED JACKET

A. Regular shape (straight run)
   1. Molded sectional, factory fabricated of heavy density resin bonded fibrous glass, with integral factory applied all service jacket of Kraft paper/aluminum foil/glass fiber reinforcement.7
   2. Insulation shall have a thermal conductivity k factor of 0.23 at 75° F. mean temperature and be suitable for direct application and service on piping having operating surface temperatures of –60 degrees to 450 degrees F.
   3. Jacket shall:
      a. Extend 1 ½" (minimum) along one edge of longitudinal joint to form a sealing lap which shall be faced inside with a paper protected pressure sensitive adhesive;
      b. Have a permanence rating of 0.02 perm/in. and a Beach puncture resistance of 50 units;
      c. Have an exterior suitable for painting with latex or water base paint.
   4. All insulation shall have composite (insulation, jacket, tape seal and adhesive used to adhere jacket to the insulation) Fire and Smoke Hazard ratings as tested under procedure ASTM E-84, NFPA 255 and UL 723, not exceeding Flame Spread of 25 and a Smoke Developed of 50. PVC fitting covers and accessories, such as adhesives, mastics, cements and cloth for fittings shall have the same component ratings.
   5. Paper laminate jackets shall be permanently flame and smoke resistant. Chemicals used for treating paper in jacket laminates shall not be water soluble and shall be unaffected by water and humidity.
   6. Fiberglass Schuler-Manville Micro-Lok, or equal.

B. Irregular shape (fittings, flanges, valves, etc.)
   1. Fibrous glass of same density, thickness, and other properties or characteristics as the adjacent regular shape insulation either pre-molded or field forged to fit the item being insulated. The pre-molded insulation shall be provided with weather protection cover.

2.02 IP-2 RIGID MOLDED SECTIONAL/OUTDOOR JACKET

A. Regular shape (straight run)
   1. Molded sectional, factory fabricated of heavy density resin bonded fibrous glass, with integral factory applied all service jacket of Kraft paper/aluminum foil/glass fiber reinforcement.

2. Insulation shall have a thermal conductivity k factor of 0.23 at 75 degrees F. mean temperature and be suitable for direct application and service on piping having operating surface temperatures of –60 degrees to 450 degrees F.
3. Jacket:
   a. Straight runs: .016" thick smooth sheet aluminum finish.
   b. Irregular shapes:
      1) Surefit Aluminum Pipe Fitting Covers for pipes up to 6”.
      2) Mitered aluminum sheet matching straight run jacketing for pipes over 6”.
   c. Alternative jacketing: Schuler-Manville Type ML, metal jacketing system.
4. All insulation shall have composite (insulation, jacket, tape seal and adhesive used to adhere jacket to the insulation) Fire and Smoke Hazard ratings as tested under procedure ASTM E-84, NFPA 255 and UL 723, not exceeding Flame Spread of 25 and a Smoke Developed of 50. PVC fitting covers and accessories, such as adhesives, mastics, cements and cloth for fittings shall have the same component ratings.
5. Paper laminate jackets shall be permanently flame and smoke resistant. Chemicals used for treating paper in jacket laminates shall not be water soluble and shall be unaffected by water and humidity.
6. Fiberglass Schuler-Manville Micro-Lok, or equal.

B. Irregular shape (fittings, flanges, valves, etc.)
   1. Fibrous glass of same density, thickness, and other properties or characteristics as the adjacent regular shape insulation, either pre-molded or field forged to fit the item being insulated. The pre-molded insulation shall be provided with weather protection cover.

2.03 IP-3 ELASTOMERIC FOAM

A. Insulation shall be Elastomeric Foam Insulation. Insulation should have a maximum service temperature of 210o F, a minimum service temperature of –40 degrees F., and a "K" factor of .28 at 75 degrees F. The flame spread of the insulation shall be 25 or less, and smoke density shall be 50 or less when tested in accordance with ASTM E84.

B. Provide U.V. protective coating for all outdoor applications similar to Fosters 30-64 coating.

C. Rubatex R-180-FS/R-1800-FS, Armstrong Armaflex or equal

2.04 IP-4 CLOSED CELL POLYOLEFIN

A. Closed cell flexible plastic foam insulation should have a "k" factor of 0.27 or less at 75 degrees F and water vapor permeability of .2 perm-inch or less. The manufacturer shall warrant the insulation to be able to be directly buried underground without any protective jacket.

B. Closed Cell Polyolefin in tubular form shall comply with ASTM C-534, UL 94HBF, UBC 42-1 Class I, ASTM E-84 (25/50), NFPA 255 (25/50), UL 723(25/50), FMVSS-302, CAN-ULC-S102.2-M88 (25/50) Flammability Classification, MEA#267-92-M, New York.

C. Provide U.V. protective coating for all outdoor applications

D. IMCOA Imcolock or equal.

2.05 IP-5 RIGID MOLDED SECTIONAL/INDOOR EXPOSED JACKET

A. Regular shape (straight run)

B. Molded sectional, factory fabricated of heavy density resin bonded fibrous glass, with integral factory applied all service jacket of Kraft paper/aluminum foil/glass fiber reinforcement.

C. Insulation shall have a thermal conductivity k factor of 0.23 at 75 degrees F. mean temperature and be suitable for direct application and service on piping having operating surface temperatures of –60 degrees to 450 degrees F.
   1. Jacket:
      a. Straight runs: PVC fitting covers with vapor barrier.

b. Irregular shapes:
   1) Amerisafe, factory molded aluminum covers, or
   2) Mitered aluminum sheet matching straight run jacketing; or
c. Alternative jacketing: Schuler-Manville Type ML, metal jacketing system.

2. All insulation shall have composite (insulation, jacket, tape seal and adhesive used to adhere jacket to the insulation) Fire and Smoke Hazard ratings as tested under procedure ASTM E-84, NFPA 255 and UL 723, not exceeding Flame Spread of 25 and a Smoke Developed of 50. PVC fitting covers and accessories, such as adhesives, mastics, cements and cloth for fittings shall have the same component ratings.
3. Paper laminate jackets shall be permanently flame and smoke resistant. Chemicals used for treating paper in jacket laminates shall not be water soluble and shall be unaffected by water and humidity.
4. Fiberglass Schuler-Manville Micro-Lok, or equal.

D. Irregular shape (fittings, flanges, valves, etc.)
1. Fibrous glass of same density, thickness, and other properties or characteristics as the adjacent regular shape insulation, either pre-molded or field forged to fit the item being insulated. The pre-molded insulation shall be provided with PVC protection cover.

PART 3 - EXECUTION

3.01 PIPING APPLICATIONS

NOTE: Where multiple systems are listed, contractor has the option to choose.

A. Condensate (CD) water piping above grade/indoors:
1. Use System IP-3. (Elastomeric Foam).
   a. ¾" thickness for all sizes
2. Use System IP-4. (Closed Cell Polyolefin).
   a. ¾" thickness for all sizes
3. Use System IP-1. (Rigid Molded Sectional/Indoor Jacket) with vapor barrier.
   a. ¾" thickness for all sizes

B. Refrigerant (RS) – Suction piping above grade/indoors
1. Use System IP-3 (Elastomeric Foam)
   a. ¾" thickness for all sizes

C. Refrigerant (RS) – Suction piping above grade/outdoors
1. Use System IP-2 (Elastomeric Foam)
   a. ¾" thickness for all sizes

D. Refrigerant (HG) – Hot gas piping above grade/indoors
1. Use System IP-3 (Elastomeric Foam)
   a. ¾" thickness for all sizes

E. Refrigerant (HG) – Hot gas piping above grade/outdoors
1. Use System IP-2 (Elastomeric Foam)
   a. ¾" thickness for all sizes

3.02 INSTALLATION

A. Unless specifically excluded herein or on the drawings, insulate all parts of piping systems and condensate drains including fittings, flanges, valves, and pipe-mounted devices, except do not cover nameplates on devices.

B. Install insulation in removable sections over unions, flanges, and line components or devices requiring periodic maintenance.

C. Install insulation butted tightly to transitions such as insulated pipe shields, insulated pipe sleeves, equipment connections, etc.

D. Install insulation on all piping systems so that condensation will not occur. Insulate all water pipe supports where hanger is directly in contact with pipe up to the point of connection to the building structure. All piping shall be supported in such a manner that neither the insulation nor the vapor/weather barrier is compromised by the hanger or the effects of the hanger. In all cases, hanger spacing shall be such that the circumferential joint may be made outside the hanger. On cold systems, vapor barrier shall be continuous, including material covered by the hanger saddle.

E. Treat equipment face piping as follows:
   1. Where not subject to condensation (hot systems) terminate insulation at the outlet side of the equipment shut-off valve, leaving the face piping un-insulated, 24” max, unless noted otherwise, except where exposed to outdoors.

F. Install insulation materials with smooth and even surfaces. Insulate each continuous run of piping with full-length units of insulation, with single cut piece to complete run. Do not use cut pieces or scraps abutting each other. Butt insulation joints firmly to ensure complete, tight fit over all piping surfaces.

G. Maintain the integrity of factory-applied vapor barrier jacketing on all pipe insulation, protecting it against puncture, tears or other damage. All staples used on cold pipe insulation shall be coated with suitable sealant to maintain vapor barrier integrity.

H. Rigid Molded Sectional/Jacketed:
   1. Comply with applicable general instructions above.
   2. Seal all transverse joints (except at PVC fitting jackets) with circumferentially applied 3" (minimum) width tape of same material as the jacket, faced with the same adhesive as the longitudinal lap, or seal with Hardcast 4" wide Type DT490-C mineral impregnated woven fiber tape (synthetic fiber indoors, cotton fiber outdoors) using Hardcast FTA-20 activator/adhesive applied by brush or roller. Seal transverse joints at PVC fittings jackets with color matching PVC tape and vapor barrier mastic adhesive.
   3. Fittings and valves shall be insulated with pre-formed fiberglass fittings, fabricated sections of fiberglass pipe insulation, blanket insulation, or insulating cement. Thickness shall be equal to adjacent pipe insulation. Finish shall be with pre-formed PVC fitting covers or as otherwise specified on contract drawings.
   4. Flanges, couplings and valve bonnets shall be covered with an oversized pipe insulation section sized to provide the same insulation thickness as on the main pipe section. An oversized insulation section shall be used to form a collar between the two insulation sections with low-density blanket insulation being used to fill gaps. Jacketing shall match that used on straight pipe sections. Rough-cut ends shall be coated with suitable weather or vapor resistant mastic as dictated by the system location and service.
   5. On hot systems where fittings are to be left exposed, insulation ends should be beveled away from bolts for easy access.
   6. On cold systems, particular care must be given to vapor sealing the fitting cover or finish to the pipe insulation vapor barrier. All valve stems shall be sealed with caulking to allow free movement of the stem but provide a seal against moisture incursion.
   7. Fit insulation terminations with Zeston, Snap Form, end cap jackets, or seal with Hardcast tape as specified above for joints.
   8. On all piping (except equipment face piping) installed outdoors, install outdoor jacketing. Install aluminum sheet jacket with all joints turned down at 45o below horizontal; secure in place with non-corroding bands and/or blind rivets (do not puncture vapor barrier insulation jacket). On equipment face piping (including equipment shut-off valve) coat the insulation with ¼" thick Fosters 30-80 or Childers CP-38 outdoor vapor barrier coating reinforced with fosters Mast a Fab or Childers Chil Glas #10 and finished with two (2) coats of aluminum paint.

9. Penetrations
    a. Extend piping insulation without interruption through walls, floors, and similar piping penetrations, except where otherwise specified.

I. Closed Cell Polyolefin:
    1. Install pre slit, pre-glued closed cell polyolefin foam pipe insulation as per manufacturer's recommendations. Seal all joints and seams with Fuse-Seal Gun or with Armstrong 520 adhesive or equal in accordance with manufacturer's written instructions. Fabricate fitting covers from polyolefin foam insulation using same procedure.

END OF SECTION

This page intentionally left blank

23 08 00
MECHANICAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.01 DESCRIPTION

A. The purpose of this section is to specify the Contractor's responsibilities and participation in the commissioning process relative to division 23.

B. The commissioning process is primarily the responsibility of the Commissioning Authority, with support for start-up, testing, and commissioning the responsibility of the Contractors. The commissioning process does not relieve the Contractor from participation in the process, or diminish the role and obligations to complete all portions of work in a satisfactory and fully operational manner.

C. Work of Division 23 includes:

1. Testing and start-up of the mechanical equipment.
2. Assistance in functional testing to verify equipment/ system performance.
3. Providing qualified personnel to assist in commissioning tests, including seasonal testing.
4. Completion and endorsement of pre-functional test checklists provided by the Commissioning Authority to assure that Division 23 equipment and systems are fully operational and ready for functional testing.
5. Providing equipment, materials, and labor necessary to correct deficiencies found during the commissioning process which fulfill contract and warranty requirements.
6. Providing training for the systems specified in Division 23 with coordination of owner.

1.02 RELATED WORK

A. All testing and start-up procedures and documentation requirements specified within Division 23.

B. Section 01 91 13 – General Commissioning Requirements

C. Commissioning functional test procedures that require participation of the Contractors.

D. Cooperate with the Commissioning Authority in the following manner:

1. Allow sufficient time before final completion dates so that test and balance and commissioning testing can be accomplished.
2. Provide labor and material to make corrections when required without undue delay.
3. Put all heating, ventilating, and air conditioning systems and equipment into full operation and continue the operation of the same during each working day of commissioning.

PART 2 - PRODUCTS

2.01 TEST EQUIPMENT

A. Standard certified test equipment for commissioning shall be provided by the TAB Contractor.

B. Proprietary test equipment required by the manufacturer, whether specified or not, shall be provided by the manufacturer of the equipment. Manufacturer shall provide the test equipment, demonstrate its use, and assist the Commissioning Authority in the commissioning process.

PART 3 - EXECUTION

3.01 WORK PRIOR TO COMMISSIONING

A. Complete all phases of work so the system can be started, tested, balanced, and otherwise commissioned. Division 23 has primary start-up responsibilities with obligations to complete systems, including all sub-systems so they are functional. This includes the complete installation of all equipment, materials, pipe, duct, wire, insulation, controls, etc., per the contract documents and related directives, clarifications, change orders, etc.

B. The Commissioning Authority will develop a Commissioning Plan. Upon request of the Commissioning Authority, the Contractor shall provide assistance and consultation. The Commissioning Plan will be developed prior to completion of the installation. The Contractor is obligated to assist the Commissioning Authority in preparing the Commissioning Plan by providing all necessary information pertaining to the actual equipment and installation.

C. Specific pre-commissioning responsibilities of Division 23 are as follows:

1. Normal start-up services required to bring each system into a fully operational state. This includes motor rotational check, cleaning, filling, purging, control sequences of operation, leak testing, full-load and part-load performance, etc. The Commissioning Authority will not begin the commissioning process until each system is complete and documented, including normal contractor start-up.
2. The Contractor shall perform pre-functional tests on the equipment and systems as noted in section 01 9100 General Commissioning Requirements.
3. Contractor start-up forms may be substituted for the pre-functional test forms with prior approval by the Commissioning Authority.
4. Pre-functional test forms will be kept in the Contractors job trailer in a Commissioning Field Notebook provided by the Commissioning Authority.
5. Factory start-up services will be provided for key equipment and systems specified in Division 23. The Contractor shall coordinate this work with the manufacturer and the Commissioning Authority.
    a. Functional testing is intended to begin upon completion of a system. Commissioning may proceed prior to the completion of systems and/or sub-systems, if expediting this work is in the best interests of the Owner. Commissioning activities and schedule will be coordinated with the Contractor. Start of commissioning before system completion will not relieve the Contractor from completing those systems as per the schedule.

D. The Field Commissioning Notebook will be used to identify and track all pertinent commissioning documentation required during the Installation phase. This Notebook will be assembled by the Commissioning Authority and maintained by the Contractor. The Notebook provides a central location for the Commissioning Authority to identify, copy and organize all pertinent information and will include the following format:

1. Summary describing Notebook contents and use.
2. Copy of Commissioning Plan for contractor field reference.
3. Listing of all specification documentation requirements listed by specification section, with sign off spots for appropriate contractors.
4. Tabs for each specification section with copies of pre-functional test check sheets provided by coordination of subcontractors and Commissioning Authority for contractor completion and space for related contractor-supplied documents.
5. Prior to functional testing the Commissioning Authority will use this book to verify that all appropriate contractors have completed their work and signed off that they have done so. Once the Commissioning Authority is satisfied that all components of a system are complete functional testing will begin.

3.02 PARTICIPATION IN COMMISSIONING

A. Provide skilled technicians to start up and debug all systems within the division of work. These same technicians shall be made available to assist the Commissioning Authority in completing the commissioning program as it relates to each system and their technical specialty. Work schedules, time required for testing, etc., will be requested by the Commissioning Authority and coordinated by the Contractor. Contractor will ensure the qualified technician(s) are available and present during the agreed-upon schedules and of sufficient duration to complete the necessary tests, adjustments, and/or problem resolutions.

B. The Commissioning Authority reserves the right to judge the appropriateness and qualifications of the technicians relative to each item of equipment, system, and/or sub-system. Qualifications of technicians include expert knowledge relative to the specific equipment involved, adequate documentation and tools to service/commission the equipment, and an attitude/willingness to work with the Commissioning Authority to get the job done. A liaison or intermediary between the Commissioning Authority and qualified factory representatives does not constitute the availability of a qualified technician for purposes of this work.

3.03 WORK TO RESOLVE DEFICIENCIES

A. Maladjustments, misapplied equipment, and/or deficient performance under varying loads will result in a system that does not meet the original design intent. Correction of work will be completed under the direction of the Architect, with input from the Contractor, equipment supplier, and Commissioning Authority. Whereas all members will have input and the opportunity to discuss, debate, and work out problems, the Architect/Engineer of Record will have final jurisdiction on the necessary work to be done to achieve performance and or design intent.

3.04 ADDITIONAL COMMISSIONING

A. Additional commissioning activities may be required after system adjustments, replacements, etc., are completed. The Contractor, suppliers, and Commissioning Authority shall include a reasonable reserve to complete this work as part of their standard contractual obligations.

3.05 SEASONAL COMMISSIONING AND OCCUPANCY VARIATIONS

A. Seasonal commissioning pertains to testing under full-load conditions during peak heating and peak cooling seasons, as well as part-load conditions in the spring and fall. Initial commissioning will be done as soon as contract work is completed regardless of season. Subsequent commissioning may be undertaken at any time thereafter to ascertain adequate performance during the different seasons.

B. All equipment and systems will be tested and commissioned in a peak season to observe full-load performance. Heating equipment will be tested during winter design extremes. Cooling equipment will be tested during summer design extremes, with a fully occupied building. The Contractor will be responsible to participate in the initial and the alternate peak season test of the systems required to demonstrate performance.

C. Subsequent commissioning may be required under conditions of minimum and/or maximum occupancy or use. All equipment and systems affected by occupancy variations will be tested and commissioned at the minimum and peak loads to observe system performance. The Contractor will be responsible to participate in the occupancy sensitive testing of systems to provide verification of adequate performance.

3.06 TRAINING

A. The Contractor will be required to participate in the training of the Owner's engineering and maintenance staff for each mechanical system and the related components. Training may be conducted in a classroom setting, with system and component documentation, and suitable classroom training aids, or in the field with the specific equipment. The type of training will be per the Owner's option.

B. Training will be conducted jointly with the equipment vendors, the Contractor and Owner's operations and maintenance representatives. The Contractor will be responsible for the generic training, as well as instructing the Owner's staff on the system peculiarities specific to this project.

C. The contractor shall provide a walk-through training session with the City Maintenance staff. The walk-through shall be a minimum of 4 hours.

3.07 SYSTEMS DOCUMENTATION

A. Contract Documents to incorporate field changes and revisions to system designs to account for actual constructed configurations will be addressed as required in Division 1. All drawings should be red-lined on two sets. Division 23 as-built drawings should include updated architectural floor plans, and the individual mechanical systems in relation to actual building layout.

1. Maintain as-built red-lines on the job site as required in Division 1.
2. In addition to the stated requirements for operation and maintenance data, provide one copy of equipment technical literature, operation and maintenance literature, and shop drawings to the Commissioning Authority as soon as they are available. This requirement is for review of these documents prior to distribution of multiple copies for the Owner's final use.

END OF SECTION

SECTION 23 09 23
DIRECT DIGITAL CONTROL SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes control equipment and installation for HVAC systems and components, including control components for terminal heating and cooling units not supplied with factory-furnished controls.

B. See "Sequences of Operation" for requirements that relate to this Section.

C. The BAS control system shall be extension of the Cities existing Siemens Apogee BAS and all controllers and software shall be the latest version of Siemens product. Provide any required software and hardware upgrades to the Cities existing database server as required to implement this project and bring the Cities system up to the current Siemens offering.

D. The BAS system shall be provided by the local Siemens Industry, Building Technologies Division branch office. Contact Andrew Jensen at (916) 769-3207 (andrew.jensen@siemens.com) for details.

1.02 RELATED DOCUMENTS

A. Drawings and Specification Sections of the Contract, including General and Supplementary Conditions, apply to this Section.
   1. Section 23 05 00 – Common Work Results for HVAC
   2. Section 23 05 93 – Testing, Adjusting, and Balancing for HVAC

1.03 DEFINITIONS

A. DDC: Direct digital controls

B. IP: Internet Protocol

C. I/O: Input/Output

D. LAN: Local area network.

E. MS/TP: Master-slave/token-passing. Refer to AHSRAE standard 135-2010

F. TCP: Transfer Control Protocol

G. Scope Terminology
   1. Provide = Furnish equipment, engineer, program and install
   2. Furnish = Furnish equipment, engineer and program
   3. Mount = securely fasten or pipe
   4. Install = mount and wire
   5. Wire = wire only

1.04 SYSTEM DESCRIPTION

A. The contractor shall furnish and install a networked system of HVAC controls. The contractor shall incorporate direct digital control (DDC) for central plant equipment, building ventilation equipment, supplemental heating and cooling equipment, and terminal units.

B. Provide networking to new DDC equipment using communication standards. Match the existing protocol. The system shall not be limited to only standard protocols, but shall also be able to integrate to a wide variety of third-party devices and applications via drivers and gateways.

C. Provide standalone controls where called for on the drawings or sequences.

D. Provide Building Automation System (BAS) integration to VRF controls systems via BACnet IP protocol. See VRF specification section for details on VRF manufacturer furnished & provided items.

E. Connect all new BAS controls to the City, with a new siemens Apogee Desigo database server, via a City provided network connection to the main building BAS panel.

F. Provide BAS integration to the building lighting system for passing occupancy information from the lighting system panels, for floors 1 of each building and the basement of building 2, to the VRF systems.

G. Coordinate for provision of relays on floor 2 through 5 of each building, to pass local occupancy information to the vav unit controllers, as noted in the control diagrams and mechanical schedules.

1.05 WORK INCLUDED

A. The installation of the control system shall be performed under the direct supervision of the controls manufacturer with the shop drawings, flow diagrams, bill of materials, component designation, or identification number and sequence of operation all bearing the name of the manufacturer.

B. Furnish a complete distributed direct digital control system in accordance with this specification section. This includes all system controllers, logic controllers, and all input/output devices. Items of work included are as follows:
   1. Provide a submittal that meets the requirements below for approval.
   2. Coordinate and installation schedule
   3. Provide installation of all panels and devices unless otherwise stated.
   4. Provide power for panels and control devices.
   5. Provide all low voltage control wiring for the DDC system.
   6. Provide miscellaneous control wiring for HVAC and related systems regardless of voltage.
   7. Provide engineering and technician labor to program and commission software for each system and operator interface. Submit commissioning reports for approval.
   8. Participate in commissioning for all equipment that is integrated into the BAS (Refer to Commissioning sections of the equipment or systems in other parts of this specification.)
   9. Provide testing, demonstration and training as specified below.

1.06 SYSTEM PERFORMANCE

A. Comply with the following performance requirements:
   1. Graphic Display: Display graphic with minimum 20 dynamic points with current data within 5 seconds.

2. Graphic Refresh: Update graphic with minimum 20 dynamic points with current data within 5 seconds.
3. Object Command: Reaction time of less than 5 seconds between operator command of a binary object and device reaction.
4. Object Scan: Transmit change of state and change of analog values to control units or workstation within 5 seconds.
5. Alarm Response Time: Annunciate alarm at workstation within 2 seconds. Multiple workstations must receive alarms within five seconds of each other.
6. Program Execution Frequency: Programmable controllers shall execute DDC PI control loops, and scan and update process values and outputs at least once per second.
7. Reporting Accuracy and Stability of Control: Report values and maintain measured variables within tolerances as follows:
   a. Water Temperature: Plus or minus 1 deg F.
   b. Water Flow: Plus or minus 5 percent of full scale.
   c. Water Pressure: Plus or minus 2 percent of full scale.
   d. Space Temperature: Plus or minus 1 deg F.
   e. Ducted Air Temperature: Plus or minus 1 deg F.
   f. Outside Air Temperature: Plus or minus 2 deg F.
   g. Dew Point Temperature: Plus or minus 3 deg F.
   h. Temperature Differential: Plus or minus 0.25 deg F.
   i. Relative Humidity: Plus or minus 2 percent.
   j. Airflow (Pressurized Spaces): Plus or minus 3 percent of full scale.
   k. Airflow (Measuring Stations): Plus or minus 5 percent of full scale.
   l. Airflow (Terminal): Plus or minus 10 percent of full scale.
   m. Air Pressure (Space): Plus or minus 0.01-inch wg.
   n. Air Pressure (Ducts): Plus or minus 0.1-inch wg.
   o. Carbon Monoxide: Plus or minus 5 percent of reading.
   p. Carbon Dioxide: Plus or minus 50 ppm.
   q. Electrical: Plus or minus 5 percent of reading.

1.07 SUBMITTALS

A. Provide submittals for fast track items that need to be approved and released to meet the schedule of the project. Provide submissions for the following items separately:
   1. Valve schedule and cut sheets
   2. Factory mounting and wiring diagrams and cut sheets
   3. Thermostat locations

B. Provide a complete submittal with all controls system information for approval before construction starts. Include the following:
   1. Schematic flow diagrams showing fans, pumps, coils, dampers, valves, and control devices.
   2. Wiring Diagrams: Power, signal, and control wiring.
   3. Details of control panel faces, including sizes, controls, instruments, and labeling.
   4. Schedule of dampers and actuators including size, leakage, and flow characteristics.
   5. If dampers are furnished by other, submit a damper actuator schedule coordinating actuator sizes with the damper schedule.
   6. Schedule of valves including leakage and flow characteristics.
   7. Written description of the Sequence of Operations.
   8. Network riser diagram showing wiring types, network protocols, locations of floor penetrations and number of control panels. Label control panels with network addresses. Show all routers, switches, hubs and repeaters.
   9. Point list for each system controller including both inputs and outputs (I/O), point numbers, controlled device associated with each I/O point, and location of I/O device.
   10. Starter and variable frequency drive wiring details of all automatically controlled motors.

11. Reduced size floor plan drawings showing locations of control panels, thermostats and any devices mounted in occupied space.

C. Product Data: Include manufacturer's technical literature for each control device indicated, labeled with setting or adjustable range of control. Indicate dimensions, capacities, performance characteristics, electrical characteristics, finishes for materials, and installation and startup instructions for each type of product indicated. Submit a write-up of the application software that will be used on the operator workstation including revision level, functionality and software applications required to meet the specifications.

D. Wiring Diagrams: Detail the wiring of the control devices and the panels. Show point-to-point wiring from field devices to the control panel. Show point-to-point wiring of hardwired interlocks. Show a ladder diagram or schematic of wiring internal to the panels, including numbered terminals. Clearly designate wiring that is done at a factory, at a panel shop or in the field.

E. Submit blank field check-out and commissioning test reports, customized for each panel or system, which will be filled out by the technician during start-up.

F. Submit sample graphics for approval before starting system commissioning.

G. Variance letter: Submit a letter detailing each item in the submission that varies from the contract specification or sequence of operation in any way.

1.08 QUALITY ASSURANCE

A. Codes
1. Perform all wiring in accordance with Division 26, NEC, local codes and Owner’s requirements.
2. Uniform Building Code (UBC)
3. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
4. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilation Systems."
5. All equipment shall be UL listed and approved and shall meet with all applicable NFPA standards, including UL 916 - PAZX Energy Management Systems,
6. Provide UL 864 – UUKL Smoke Control, where controllers and networks are used for that purpose.
   a. Provide written approvals and certifications after installation has been completed.
7. All electronic equipment shall conform to the requirements of FCC Regulation, Part 15, Governing Radio Frequency Electromagnetic Interference and be so labeled.
8. The manufacturer of the building automation system shall provide documentation supporting compliance with ISO-9002 (Model for Quality Assurance in Production, Installation, and Servicing) and ISO-140001 (The application of well-accepted business management principles to the environment). The intent of this specification requirement is to ensure that the products from the manufacturer are delivered through a Quality System and Framework that will assure consistency in the products delivered for this project.

B. Qualifications
1. Installing contractor shall be in the business of installing and servicing DDC controls for mechanical systems, temperature and ventilation control, environmental control, lighting control, access and security controls, and energy automation as their primary business. Installer Qualifications: An experienced installer who is the authorized representative of the automatic control system manufacturer for both installation and maintenance of controls required for this Project.

2. Engineering, drafting, programming, and graphics generation shall be performed by the local branch engineers and technicians directly employed by the Building Automation System Contractor.
3. Supervision, checkout and commissioning of the system shall be by the local branch engineers and technicians directly employed by the Building Automation System Contractor. They shall perform commissioning and complete testing of the BAS system.

C. The contractor shall maintain a service organization consisting of factory trained service personnel and provide a list of ten (10) projects, similar in size and scope to this project, completed within the last five years.

D. Final determination of compliance with these specifications shall rest solely with the Engineers and Owner who will require proof of prior satisfactory performance.

E. For any BAS system and equipment submitted for approval, the BAS contractor shall state what, if any, specific points of system operation differ from these specifications.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Factory-Mounted Components: Where control devices specified in this Section are indicated to be factory mounted on equipment, arrange for shipping of control devices to unit manufacturer.

1.10 COORDINATION

A. Coordinate location of thermostats, humidistats, panels, and other exposed control components with plans and room details before installation.

B. Coordinate equipment with Section 26 00 00 "Fire Alarm" to achieve compatibility with equipment that interfaces with that system.

C. Coordinate power needs for the BAS controllers

D. Coordinate equipment with provider of starters and drives to achieve compatibility with motor starter control coils and VFD control wiring.

E. Coordinate scheduling. Submit a schedule for approval based upon the installation schedule of the mechanical equipment.

F. Products Furnished but Not Installed Under This Section
1. Hydronic Piping:
   a. Control Valves
   b. Temperature Sensor Wells and Sockets
   c. Flow Switches
   d. Flow Meters
2. Refrigerant Piping
   a. Pressure and Temperature Sensor Wells and Sockets
3. Sheetmetal accessories
   a. Dampers
   b. Airflow Stations
   c. Terminal Unit Controls

G. Products Integrated To but Not Furnished or Installed Under This Section
1. Heat pumps
2. Packaged AC units

3. Computer room AC units
4. VFDs
5. Fire Alarm monitoring

1.11 WARRANTY

A. Conform to the warranty requirement of the Contract Documents, General Requirements and this section or a minimum of 12 months. Provide the strictest.

B. Warranty shall cover all costs for parts, labor, associated travel, and expenses for a period of one year from completion of system demonstration.

C. Hardware and software personnel supporting this warranty agreement shall provide on-site or off-site service in a timely manner after failure notification to the vendor. The maximum acceptable response time to provide this service at the site shall be 24 hours.

D. During normal building occupied hours, failure of items that are critical for system operation shall be provided within 4 hours of notification from the Owner's Representative.

E. This warranty shall apply equally to both hardware and software.

PART 2 - PRODUCTS

2.01 ACCEPTABLE SYSTEMS

A. Provide a Building Automation System based upon the following:
   1. Siemens APOGEE System as installed by the Siemens Industry branch office, no substitutions will be considered. Contact Andrew Jensen at (916) 769-3207 (andrew.jensen@siemens.com).

B. The vendors and products listed shall comply with these specifications. It shall not be assumed that standard products and methods will be acceptable without prior approval. Exceptions shall be noted during the bid process and documented in the submittal process.

2.02 BAS NETWORK

A. BAS protocol for this project shall be BACnet.

B. Access to system data shall not be restricted by the hardware configuration of the building management system. The hardware configuration of the BMS network shall be totally transparent to the user when accessing data or developing control programs.
   1. Software applications, features, and functionality, including administrative configurations, shall not be separated into several network control engines working together.

C. Provide at a minimum 1 operator interface to be designated as the BAS Server with server application software. Additional operator interfaces shall use operator workstation licenses or connect via a thick or thin-client application.

D. BAS Server shall be capable of simultaneous direct connection and communication with BACnet/IP, OPC and TCP/IP corporate level networks without the use of interposing devices.

E. Any break in Ethernet communication from the PC to the controllers on the Primary Network shall result in a notification at the PC.

F. Any break in Ethernet communication between the standard client and server workstations on the Primary Network shall result in a notification at each workstation.

G. The network architecture shall consist of three levels of networks:
   1. The Management level shall utilize Apogee TCP/IP or BACnet/IP over Ethernet along with other standardized protocol, such as web services, html, JAVA, SOAP, XML, etc., to transmit data to non-BAS softwares and databases.
   2. The Automation level network shall be Apogee TCP/IP or BACnet/IP over Ethernet. It shall network the Automation Server, Operator workstations, and BC level controllers. Provide network media converters, routers and switches as necessary for a complete network.
   3. The Floor level network shall be Apogee P1 (FLN) or BACnet over MS/TP. It shall network to all of the DDC controlled equipment on a floor or in a system and network to a router that connects to the Automaton level BAS backbone.

H. The primary backbone network between the building level controllers, BAS Server and Operator Workstations shall be based upon Apogee TCP/IP or BACnet/IP. Ethernet Network switches shall be strategically placed through the building to cover several floors or several mechanical rooms that are within 300 ft wiring-feet of each other.

I. Controllers for the central plant and large infrastructure air handlers shall reside on the TCP/IP backbone or BACnet/IP network.

J. The Building Level Controllers shall be able to support subnetwork protocols that may be needed depending on the type of equipment or application. Subnetworks shall be limited to :
   1. BACnet MS/TP
   2. Modbus

K. Advanced Application Controllers for smaller single zone, supplemental or special systems can reside on the BACnet/IP network or on a subnetwork.

L. Application Specific Controllers, Floor level controllers, terminal units, package AC units, auxiliary equipment, VFDs, meters shall reside on one of the subnetworks above.

M. Provide all communication media, connectors, switches, and routers necessary for the internetwork.

N. Use fiber optic cabling for all Ethernet runs longer than 300 ft.

O. Provide all communication media, connectors, switches, and routers necessary for the internetwork.

P. The system shall meet peer-to-peer communication services such that the values in any one BC or AAC level controller can be read or changed from all other controllers without the need for intermediary devices. The software shall provide transparent transfer of all data, control programs, schedules, trends, and alarms from any one controller through the internetwork to any other controller, regardless of subnetwork routers.

Q. Systems that use variations of BACnet using Point-to-Point (PTP) between controllers or networks that are not peer-to-peer are not allowed.

R. Remote Communications: Provide a TCP/IP compatible communication port for connection to the Owner's network for remote communications. Provide coordination with the Owner for addressing and router configuration on both ends of the remote network.

S. Where a smoke control application is required, provide UUKL listed network switches, and NFPA approved cabling, enclosures and installation methods.

T. The system shall be installed with a 10% spare capacity on each subnetwork for the addition of future controllers.

2.03 DISTRIBUTED CONTROL REQUIREMENTS

A. The loss of any one DDC controller shall not affect the operation of other HVAC systems, only for the points connected to the DDC controller.

B. The system shall be scalable in nature and shall permit expansion of both capacity and functionality through the addition of sensors, actuators, DDC Controllers, and operator devices.

C. System architectural design shall eliminate dependence upon any single device for alarm reporting and control execution. Each DDC Controller shall operate independently by performing its own specified control, alarm management, operator I/O, and data collection. The failure of any single component or network connection shall not interrupt the execution of any control strategy, reporting, alarming and trending function, or any function at any operator interface device.

D. DDC Controllers shall be able to access any data from, or send control commands and alarm reports directly to, any other DDC Controller on the network without dependence upon a central processing device. DDC Controllers shall also be able to send alarms to multiple operator workstations without dependence upon a central or intermediate processing device.

E. The DDC control panel shall be mounted in the same mechanical room as the equipment being controlled, or an adjacent utility room.

F. Multiple systems can be programmed on the same controller as long as they are in the same room. Systems on separate floors shall have separate controllers.

G. VAV boxes subnetworks shall be connected to the AHU controller that feeds those boxes. If multiple subnetworks are needed, then the VAV shall be grouped into subnetworks in an orderly method, such as per floor, per wing, etc.

H. Remote sensors shall be wired to the control panel of the equipment it is controlling, not across the network.

I. Signals to remote motor control centers shall be hard wired to the control panel, not across the network.

J. Terminal units shall each have their own controller. Only exceptions are:
   1. Groups of reheat coils
   2. Groups of exhaust fans
   3. Groups of chilled beams serving same zone or several adjacent zones

2.04 ELECTRONIC DOCUMENTATION

A. Provide software applications and files to view documentation through the GUI.

B. Provide a CAD viewer to view all project AutoCAD documents that are made available by the Architect and Owner.

C. Provide all controls cut sheets in PDF format. Make them available to any user accessing the system over the Internet.

D. Provide a text version of the sequence of operation. Make the written sequence available from the graphic that represents each system. The sequence shall pop up in a printable format such as HTML or PDF.

2.05 CONTROLLER SOFTWARE (i.e. Building Controller software, DDC software, Field Panel software)

A. Provide a full capability user license to the owner for the operator to be able to see, modify, create, upload, download and save control programs to the DDC controllers.

B. The software program shall be provided as an integral part of DDC Controllers and shall not be dependent upon any higher level computer or another controller for execution.

C. The software application shall be accessible from a PC using the Windows environment, but shall use all of its own services and data files so as to not be susceptible to Microsoft Windows operating systems based viruses.

D. The software shall be provided with an interactive HELP function to assist operators with syntax, abbreviations, commands and saving programs.

E. Point naming and communication format:
1. All points, panels, and programs shall be identified by a 30-character name. All points shall also be identified by a 16-character point descriptor. The same names shall be displayed at both Building Controller and the Operator Interface.
2. All digital points shall have a consistent, user-defined, two-state status indication with 8 characters minimum (e.g., Summer, Enabled, Disabled, Abnormal).
3. Match the existing protocol.

F. System Security
1. User access shall be secured using individual security passwords and user names.
2. Passwords shall restrict the user to the objects, applications, and system functions as assigned by the system manager.
3. Building Controllers shall be able to assign a minimum of 50 passwords access and control priorities to each point individually. The logon password (at any Operator Interface or portable operator terminal) shall enable the operator to monitor, adjust and control only the points that the operator is authorized for. All other points shall not be displayed at the Operator Interface or portable terminal. Passwords and priorities for every point shall be fully programmable and adjustable.
4. User Log On/Log Off attempts shall be recorded.
5. The system shall protect itself from unauthorized use by automatically logging off following the last keystroke. The delay time shall be user-definable.
6. Use of workstation resident security as the only means of access control is not an acceptable alternative to resident system security in the DDC controller software.

G. User Defined Control Applications: The applications software shall program DDC routines to meet the sequences of operations.
1. Building Controllers shall have the ability to perform energy management routines including but not limited to time of day scheduling, calendar-based scheduling, holiday scheduling, temporary schedule overrides, start stop time optimization, automatic daylight

savings time switch over, night setback control, enthalpy switch over, peak demand limiting, temperature-compensated duty cycling, heating/cooling interlock, supply temperature reset, priority load shedding, and power failure restart.

2. The Building Controllers shall have the ability to perform the following pre tested control algorithms:
   a. Two position with differential control and time delays
   b. Floating control
   c. Proportional control
   d. Proportional plus integral control
   e. Proportional, integral, plus derivative control
   f. Automatic tuning of control loops
   g. Model-free adaptive control
3. Controllers shall be able to execute custom, job-specific processes defined by the user, to automatically perform calculations and special control routines.
4. Each controller shall support plain language text comment lines in the operating program to allow for quick troubleshooting, documentation, and historical summaries of program development.

H. Peer-to-peer access to other DDC controllers
1. It shall be possible to use any actual or virtual point data or status, any system calculated data, a result from any process, or any user-defined constant in any controller in the system.
2. Any process shall be able to issue commands to points in any and all other controllers in the system.
3. Processes shall be able to generate operator messages and advisories to other operator I/O devices. A process shall be able to directly send a message to a specified device or cause the execution of an advanced annunciation feature, such as:
   a. Generate a report
   b. Annunciate an alarm
   c. Issue a text message or email

I. Alarm Management
1. Alarm management shall be provided within the controller software to monitor and direct alarm information to operator devices.
2. Each Building Controller shall perform distributed, independent alarm analysis, minimize network traffic and prevent alarms from being lost. At no time shall the Building Controllers ability to report alarms be affected by either operator or activity at a PC workstation, local I/O device or communications with other panels on the network.
3. Conditional alarming shall allow generation of alarms based upon user defined multiple criteria.
4. An Alarm “shelving” feature shall be provided to disable alarms during testing. (Pull the Plug, etc.).
5. Binary Alarms. Each binary alarm object shall be set to alarm based on the operator-specified state. Provide the capability to automatically and manually disable alarming.
6. Analog Alarms. Each analog alarm object shall have both high and low alarm limits. Alarming must be able to be automatically and manually disabled.
7. All alarm shall include the point's user-defined language description and the time and date of occurrence.
8. Alarm reports and messages shall be routed to user-defined list of operator workstations, or other devices based on time and other conditions. An alarm shall be able to start programs, print reports, be logged in the event log, generate custom messages, and display graphics.
9. The user shall be able to add a 200-character alarm message to each alarm point to more fully describe the alarm condition or direct operator response. Each Building Controller shall be capable of storing a library of at least 50 alarm messages. Each message may be assigned to any number of points in the Controller.

10. Operator-selected alarms shall be capable of initiating a trigger to an advanced annunciation, such as text, email, etc.
11. An alarm history log shall report the start of the alarm condition, acknowledgement by a user and return of the alarm to normal condition.

J. Scheduling:
   1. Provide a comprehensive menu driven program to automatically start and stop designated multiple objects or events in the system according to a stored time.
   2. Schedules shall reside in the building controller and shall not rely on external processing or network.
   3. It shall be possible to define a group of objects as a custom event (i.e., meeting, athletic activity, etc.). Events can then be scheduled to operate all necessary equipment automatically.
   4. For points assigned to one common load group, it shall be possible to assign variable time delays between each successive start and/or stop within that group.
   5. The operator shall be able to define the following information:
      a. Time, day
      b. Commands such as on, off, auto, etc.
      c. Time delays between successive commands.
      d. There shall be provisions for manual overriding of each schedule by an authorized operator.
   6. It shall be possible to schedule calendar-based events up to one year in advance based on the following:
      a. Weekly Schedule. Provide separate schedules for each day of the week. Each of these schedules should include the capability for start, stop, optimal start, optimal stop, and night economizer. When a group of objects are scheduled together as an Event, provide the capability to adjust the start and stop times for each member.
      b. Exception Schedules. Provide the ability for the operator to designate any day of the year as an exception schedule. Exception schedules may be defined up to a year in advance. Once an exception schedule is executed, it will be discarded and replaced by the standard schedule for that day of the week.

K. Peak Demand Limiting (PDL):
   1. The Peak Demand Limiting (PDL) program shall limit the consumption of electricity to prevent electrical peak demand charges.
   2. PDL shall continuously track the amount of electricity being consumed, by monitoring one or more electrical kilowatt-hour/demand meters. These meters may measure the electrical consumption (kWh), electrical demand (kW), or both.
   3. PDL shall sample the meter data to continuously forecast the demand likely to be used during successive time intervals.
   4. If the PDL forecasted demand indicates that electricity usage is likely to exceed a user preset maximum allowable level, then PDL shall automatically shed electrical loads.
   5. Once the demand peak has passed, loads that have been shed shall be restored and returned to normal control.

L. Temperature-compensated duty cycling
   1. User defined conditions shall be able to initiate a Duty Cycle Control Program.
   2. The Duty Cycle Control Program (DCCP) shall be configured to periodically stop and start loads according to various patterns.
   3. The loads shall be cycled such that there is a net reduction in both the electrical demands and the energy consumed.

M. Automatic Daylight Savings Time Switchover. The system shall provide automatic time adjustment for switching to/from Daylight Savings Time.

N. Night setback control. The system shall provide the ability to automatically adjust setpoints for night control.

O. Enthalpy switchover (economizer). The Building Controller Software (BCS) shall control the position of the air handler relief, return, and outside air dampers. If the outside air dry bulb temperature falls below changeover setpoint the BCS will modulate the dampers to provide 100 percent outside air. The user will be able to quickly change over to an economizer system based on dry bulb temperature and will be able to override the economizer cycle and return to minimum outside air operation at any time.

P. Control Loop Algorithm
   1. Provide a PID (proportional-integral-derivative) closed-loop control algorithm with direct or reverse action and anti-windup. The algorithm shall calculate a time-varying analog value that is used to position an output or stage a series of outputs. The controlled variable, setpoint, and weighting parameters shall be accessible from the operator workstation.

Q. Adaptive Loop Tuning
   1. Building Controllers shall also provide high resolution sampling capability for verification of DDC control loop performance. Documented evidence of tuned control loop performance shall be provided on a monthly, seasonal, quarterly, annual period.
   2. For Model-Free Adaptive Control loops, evidence of tuned control loop performance shall be provided via graphical plots or trended data logs. Graphical plots shall minimally include depictions of setpoint, process variable (output), and control variable (e.g., temperature). Other parameters that may influence loop control shall also be included in the plot (e.g., fan on/off, mixed-air temp).
   3. For PID control loops, operator-initiated automatic and manual loop tuning algorithms shall be provided for all operator-selected PID control loops. Evidence of tuned control loop performance shall be provided via graphical plots or trended data logs for all loops.
      a. In automatic mode, the controller shall perform a step response test with a minimum one-second resolution, evaluate the trend data, calculate the new PID gains and input these values into the selected LOOP statement.
      b. Loop tuning shall be capable of being initiated either locally at the Building Controller, from a network workstation or remotely using dial-in modems. For all loop tuning functions, access shall be limited to authorized personnel through password protection.

R. Logic programming: Provide a software routine that can build ladder logic to control using many conditional statements.
   1. The logic programming syntax shall be able to combine ladder logic with other software features, such as combining status, scheduling, PDL and alarm conditions into one conditional decision.
   2. Logic programming shall be able to reference conditions in any other controller in the system.

S. Staggered Start:
   1. This application shall prevent all controlled equipment from simultaneously restarting after a power outage. The order in which equipment (or groups of equipment) is started, along with the time delay between starts, shall be user definable in an application and shall not require written scripts or ladder logic.
   2. Upon the resumption of power, each Building Controller shall analyze the status of all controlled equipment, compare it with normal occupancy scheduling and turn equipment on or off as necessary to resume normal operations.

T. Totalization Features:

1. Run-Time Totalization. Building Controllers shall automatically accumulate and store run-time hours for all digital input and output points. A high runtime alarm shall be assigned, if required, by the operator.
2. Consumption totalization. Building Controllers shall automatically sample, calculate and store consumption totals on a daily, weekly or monthly basis for all analog and digital pulse input type points.
3. Event totalization. Building Controllers shall have the ability to count events such as the number of times a pump or fan system is cycled on and off. Event totalization shall be performed on a daily, weekly or monthly basis for all points. The event totalization feature shall be able to store the records associated with events before reset.

U. Data Collection:
1. A variety of historical data collection utilities shall be provided to manually or automatically sample, store, and display system data for all points.
2. Building Controllers shall store point history data for selected analog and digital inputs and outputs:
3. Any point, physical or calculated may be designated for trending. Any point, regardless of physical location in the network, may be collected and stored in each Building Controllers point group.
4. Two methods of collection shall be allowed: either by up to four pre-defined time intervals or upon a pre-defined change of value. Sample intervals of l minute to 7 days shall be provided.
5. Each Building Controller shall have a dedicated RAM-based buffer for trend data and shall be capable of storing a minimum of 10,000 data samples.
6. Trend data shall be stored at the Building Controllers and uploaded to the workstation when retrieval is desired. Uploads shall occur based upon either user-defined interval, manual command or when the trend buffers are full. All trend data shall be available for use in third-party personal computer applications.

2.06 BUILDING CONTROLLERS (B-BC)

A. Provide all necessary hardware for a complete operating system as required. The Building Controller shall be able to operate as a standalone panel and shall not be dependent upon any higher level computer or another controller for operation.

B. Basis of design is Siemens PX Modular and Compact Controllers (PXC).

C. This level of controller shall be used for the following types of systems:
1. Chiller plant systems
2. Heating plant systems
3. Cooling Towers
4. Pumping systems
5. VAV air handlers
6. Air handlers over 6,000 cfm
7. Systems with over 24 input/output points

D. Computing power and memory minimum:
1. A 32-bit, stand-alone, multi-tasking, multi-user, real-time 100MHz digital control microprocessor module.
2. Inputs shall be 16-bit minimum analog-to-digital resolution
3. Outputs shall be 10-bit minimum digital-to-analog resolution
4. Memory module (24 Megabyte, minimum) to accommodate all Primary Control Panel software requirements, including but not limited to, its own operating system and databases (see Controllers Software section), including control processes, energy management applications, alarm management applications, historical/trend data for

points specified, maintenance support applications, custom processes, operator I/O, dial-up communications.
5. Real time clock and battery
6. Data collection/ Data Trend module sized for 10,000 data samples.
7. Flash Memory Firmware: Each Building Level Control Panel shall support firmware upgrades without the need to replace hardware.

E. Onboard or Modular hardware and connections:
1. Primary Network communication module, if needed for primary network communications.
2. Secondary Network communication module, if needed for secondary network communications.
3. RJ45 port 10/100Mbaud
4. RS485 ports for subnetworks and point expansion
5. Man to Machine Interface port (MMI)
6. USB Port

F. Input and Output Points Hardware
1. Input/output point modules as required including spare capacity.
2. Monitoring of the status of all hand-off-auto switches.
3. Monitoring of all industry standard types of analog and digital inputs and outputs, without the addition of equipment to the primary control panel.
4. Local status indication for each digital input and output for constant, up-to-date verification of all point conditions without the need for an operator I/O device. Each primary control panel shall perform diagnostics on all inputs and outputs and a failure of any input or output shall be indicated both locally and at the operator workstation.
5. Graduated intensity LEDs or analog indication of value for each analog output.

G. Code compliance
1. Approvals and standards: UL916; CE; FCC
2. Provide UL864-UUKL where called for in the sequences of operations.

H. Accessories:
1. Appropriate NEMA rated metal enclosure.
2. Power supplies as required for all associated modules, sensors, actuators, etc.

I. Keypad.
1. Where called for in the sequence of operation, or on the plans, a local keypad and display shall be provided for each controller. The keypad shall be provided for interrogating and editing data. An optional system security password shall be available to prevent unauthorized use of the keypad and display.

J. The operator shall have the ability to manually override automatic or centrally executed commands at the primary control panels via local, point discrete, on-board hand/off/auto operator override switches. If on board switches are not available, provide separate control panels with HOA switches. Mount panel adjacent to primary control panel. Provide hand/off/auto switch for each digital output, including spares.

K. Each Building Level Control Panel shall continuously perform self-diagnostics on all hardware modules and network communications. The System Level Control Panel shall provide both local and remote annunciation of any detected component failures, low battery conditions or repeated failure to establish communication with any system.

L. Panel setup, point definitions and sequencing diagrams shall be backed up on EEPROM memory.

M. Power loss. In the event of the loss of power, there shall be an orderly shutdown of all Building Controllers to prevent the loss of database or operating system software. Non-volatile memory shall be incorporated for all critical controller configuration data and battery backup shall be provided to support the real-time clock and all volatile memory for a minimum of 30 days.

N. Building Level control panels shall provide at least two serial data communication ports for operation of operator I/O devices such as industry standard printers, operator terminals, modems and portable laptop operator's terminals. Primary control panels shall allow temporary use of portable devices without interrupting the normal communications, operation of permanently connected modems, printers or terminals.

O. Building Level Controllers shall have the capability to serve as a gateway between Modus subnetworks and the BAS System. Provide software, drives and programming.

P. Isolation shall be provided at all primary control panel terminations, as well as all field point terminations to suppress induced voltage transients consistent with IEEE Standards 587-1980.

Q. Spare Capacity: Provide enough inputs and outputs to handle the equipment shown to be “future” on drawings and 10% more of each point type. Provide all hardware modules, software modules, processors, power supplies, communication controllers, etc. required to ensure adding a point to the spare point location only requires the addition of the appropriate sensor/actuator and field wiring/tubing.

R. Environment.
1. Controller hardware shall be suitable for the anticipated ambient conditions.
2. Controllers used outdoors and/or in wet ambient conditions shall be mounted within waterproof enclosures and shall be rated for operation at 0°C to 49°C (32°F to 120°F).
3. Controllers used in conditioned space shall be mounted in dust-proof enclosures and shall be rated for operation at 0°C to 49°C (32°F to 120°F).

S. Immunity to power and noise.
1. Controller shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80% nominal voltage.
2. Operation shall be protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W at 1 m (3 ft).
3. Isolation shall be provided at all primary network terminations, as well as all field point terminations to suppress induced voltage transients consistent with:
    a. RF-Conducted Immunity (RFCI) per ENV 50141 (IEC 1000-4-6) at 3V.
    b. Electro Static Discharge (ESD) Immunity per EN 61000-4-2 (IEC 1000-4-2) at 8 kV air discharge, 4 kV contact.
    c. Electrical Fast Transient (EFT) per EN 61000-4-4 (IEC 1000-4-4) at 500V signal, 1 kV power.
    d. Output Circuit Transients per UL 864 (2,400V, 10A, 1.2 Joule max).
4. Isolation shall be provided at all Building Controller’s AC input terminals to suppress induced voltage transients consistent with:
    a. IEEE Standard 587 1980
    b. UL 864 Supply Line Transients
    c. Voltage Sags, Surge, and Dropout per EN 61000-4-11 (EN 1000-4-11)

2.07 ADVANCED APPLICATION CONTROLLERS

A. Provide all necessary hardware for a complete operating system as required. The Advanced Application-level control panel shall be able to operate as a standalone panel and shall not be dependent upon any higher-level computer or another controller for operation.

B. Basis of design is Unitary Equipment Controller (PXCxx-UCM).

C. The Advanced Application Controller shall have the capability to act as a router between Floor Level subnetworks and Automation Level network. This level of controller shall be used for the following types of systems:
   1. Secondary Pumping systems
   2. VAV air handlers
   3. Air handlers up to 8,000 cfm
   4. Systems with over 12 controlled points
   5. Systems with custom sequences

D. Each System Level Control Panel shall, at a minimum, be provided with:
   1. Appropriate NEMA rated metal enclosure.
   2. A 32-bit, stand-alone, multi-tasking, multi-user, real-time digital control microprocessor module.
   3. Inputs shall be 16-bit minimum digital resolution
   4. Outputs shall be 10-bit minimum digital resolution
   5. Primary Network communication module, if needed for primary network communications.
   6. Secondary Network communication module, if needed for secondary network communications.
   7. Memory module (4 Megabyte, minimum) to accommodate all Primary Control Panel software requirements, including but not limited to, its own operating system and databases, including control processes, energy management applications, alarm management applications, historical/trend data for points specified, maintenance support applications, custom processes, operator I/O, dial-up communications.
   8. Real time clock and battery
   9. Data collection/ Data Trend module sized for 10,000 data samples.
   10. Power supplies as required for all associated modules, sensors, actuators, etc.
   11. Input/output point modules as required including spare capacity.
   12. Software modules as required for all sequences of operation, logic sequences and energy management routines. Relay logic is not acceptable.
   13. Monitoring of the status of all hand-off-auto switches. The status of the hand-off-auto switch shall be available as a BAS data point.
   14. Monitoring of all industry standard types of analog and digital inputs and outputs, without the addition of equipment to the primary control panel.
   15. Local status indication for each digital input and output for constant, up-to-date verification of all point conditions without the need for an operator I/O device. Each primary control panel shall perform diagnostics on all inputs and outputs and a failure of any input or output shall be indicated both locally and at the operator workstation.
   16. Graduated intensity LEDs or analog indication of value for each analog output.
   17. Approvals and standards: UL916; CE; FCC
   18. Provide UL864-UUKL where called for in the sequences of operations.

E. Each System Level Control Panel shall continuously perform self-diagnostics on all hardware modules and network communications. The System Level Control Panel shall provide both local and remote annunciation of any detected component failures, low battery conditions or repeated failure to establish communication with any system.

F. Panel setup, point definitions and sequencing diagrams shall be backed up on EEPROM memory.

G. Each Advanced Application Control Panel shall provide battery backup to support the real-time clock and RAM memory, such as trend logs, for a minimum of 100 hours.

H. Each System Level Control Panel shall support firmware upgrades without the need to replace hardware.

I. System Level control panels shall provide at least two RS-232C serial data communication ports for operation of operator I/O devices such as operator terminals, and additional memory. Primary control panels shall allow temporary use of portable devices without interrupting the normal communications.

J. Isolation shall be provided at all primary control panel terminations, as well as all field point terminations to suppress induced voltage transients consistent with IEEE Standards 587-1980.

K. Spare Capacity: Provide enough inputs and outputs to handle the equipment shown to be "future" on drawings and 10% more of each point type. Provide all hardware modules, software modules, processors, power supplies, communication controllers, etc. required to ensure adding a point to the spare point location only requires the addition of the appropriate sensor/actuator and field wiring/tubing.

2.08 APPLICATION SPECIFIC CONTROLLERS

A. Each Application-Level Control Panel shall operate as a stand-alone controller capable of performing its user selectable control routines independently of any other controller in the system. Each application specific controller shall be a microprocessor-based, multi-tasking, real-time digital control processor.

B. Basis of design is Siemens BTEC controller.

C. Provide an Application Specific Control Panel for each of the following types of equipment (if applicable):
1. Constant Air Volume (CAV) boxes
2. Fan coil Units
3. Fan Powered Variable Air Volume (VAV) Boxes
4. Reheat Coils
5. Supplemental AC units
6. Variable Air Volume (VAV) Boxes
7. Other terminal equipment

D. Each Application Specific Controller shall, at a minimum, be provided with:
1. Appropriate NEMA rated enclosure
2. Floor Level network communications ability
3. Power supplies as required for all associated modules, sensors, actuators, etc.
4. Software as required for all sequences of operation, logic sequences and energy management routines.
5. A portable operator terminal connection port
6. Auxiliary enclosure for analog output transducers, isolation relays, etc. Auxiliary enclosure shall be part of primary enclosure or mounted adjacent primary enclosure
7. Each controller measuring air volume shall include provisions for manual and automatic calibration of the differential pressure transducer in order to maintain stable control and insuring against drift over time
8. Each controller measuring air volume shall include a differential pressure transducer
9. Approvals and standards: UL916; CE; FCC

E. Each Application Specific Controller shall continuously perform self-diagnostics on all hardware and secondary network communications. The Application Specific Controller shall provide both local and remote annunciation of any detected component failures, low battery conditions, or repeated failure to establish communication to the system.

F. Provide each Application Specific Controller with sufficient memory to accommodate point databases, operating programs, local alarming and local trending. All databases and programs

shall be stored in non-volatile EEPROM, EPROM and PROM. The controllers shall be able to return to full normal operation without user intervention after a power failure of unlimited duration. Provide uninterruptible power supplies (UPSs) of sufficient capacities for all terminal controllers that do not meet this protection requirement. Operating programs shall be field-selectable for specific applications. In addition, specific applications may be modified to meet the user's exact control strategy requirements, allowing for additional system flexibility. Controllers that require factory changes of all applications are not acceptable.

G. The Application Specific Controller shall be powered from a 24 VAC source provided by the contractor and shall function normally under an operating range of 18 to 28 VAC (-25% to +17%), allowing for power source fluctuations and voltage drops. Install plenum data line and sensor cable in accordance with local code and NEC. The controllers shall also function normally under ambient conditions of 32 to 122 F (0 to 50 C) and 10% to 95%RH (non-condensing). Provide each controller with a suitable cover or enclosure to protect the intelligence board assembly.

2.09 ROUTERS

A. Provide a router for each subnetwork to connect the floor level network to the base building backbone level network.

2.10 BASE BUILDING BACKBONE PORTS

A. On each building, at the rooftop equipment, provide an Ethernet RJ45 connection that allows connection to the IP network. An open port shall always be available and shall not require any part of the network to be disconnected. The location shall be accessible to the base building personnel and not in a location where the tenant can restrict the access. See mechanical drawings.

2.11 CONTROL PANELS

A. Controllers in mechanical rooms shall be mounted in NEMA 1 enclosures.

B. Mount on walls at an approved location or provide a free standing rack.

C. Panels shall be constructed of 16 gauge, furniture-quality steel, or extruded-aluminum alloy, totally enclosed, with hinged doors and keyed lock and with ANSI 61 gray polyester-powder painted finish, UL listed. Provide common keying for all panels.

D. Provide power supplies for control voltage power.

E. Dedicate 1 power supply to the DDC controller. Other devices shall be on a separate power supply, unless the power for the control device is derived from the controller terminations.

F. Power supplies for controllers shall be a transformer with a fuse or circuit breaker. Power supplies for other devices can be plain transformers.

G. All power supplies for 24V low voltage wiring shall be class 2 rated and less than 100VA. If low voltage devices require more amps, then provide multiple power supplies. If a single device requires more amps, then provide a dedicated power supply in a separate enclosure and run a separate, non-class 2 conduit to the device.

H. Surge transient protection shall be incorporated in design of system to protect electrical components in all DDC Controllers and operator’s workstations.

I. All devices in a panel shall be permanently mounted, including network switches, modems, media converters, etc.

J. Provide a pocket to hold documentation.

2.12 GENERAL SPECIFICATIONS FOR DEVICES

A. Provide mounting hardware for all devices, including actuator linkages, wells, installation kits for insertion devices, wall boxes and fudge plates, brackets, etc.

B. If a special tool is required to mount a device, provide that tool.

2.13 SENSORS

A. Terminal Unit Space Thermostats
   1. Each controller performing space temperature control shall be provided with a matching room temperature sensor.
      a. Plain Space Temperature Sensors – Wired: Where called for in the sequences or on the drawings, provide sensors with plain covers.
      b. The sensing element for the space temperature sensor shall be thermistor type providing the following.
         1) Element Accuracy: + /- 1.0°F
         2) Operating Range: 55 to 95°F
         3) Set Point Adjustment Range: 55 to 95°F
         4) Calibration Adjustments: None required
         5) Installation: Up to 100 ft. from controller
         6) Auxiliary Communications Port: as required
         7) Local LCD Temperature Display: as required
         8) Setpoint Adjustment Dial as required
         9) Occupancy Override Switch as required
      c. Auxiliary Communication Port. Each room temperature sensor shall include a terminal jack integral to the sensor assembly. The terminal jack shall be used to connect a portable operator's terminal to control and monitor all hardware and software points associated with the controller. RS-232 communications port shall allow the operator to query and modify operating parameters of the local room terminal unit from the portable operator’s terminal.
   2. Digital Display temperature sensor specifications – Wired:
      a. As called for in the sequences of operations or on the drawings, provide temperature sensors with digital displays.
      b. The sensing element for the space temperature sensor must be IC-based and provide the following.
         1) Digitally communicating with the Application Specific Controller.
         2) Mountable to and fully covering a 2 x 4 electrical junction box without the need for an adapter wall plate.
         3) IC Element Accuracy: +/- 0.9°F
         4) Operating Range: 55 to 95°F
         5) Setpoint Adjustment Range: User limiting, selectable range between 55 and 95°F
         6) Display of temperature setpoint with numerical temperature values
         7) Display of temperature setpoint graphically, with a visual Hotter/Colder setpoint indication
         8) Calibration: Single point, field adjustable at the space sensor to +/- 5°F
         9) Installation: Up to 100 ft. from controller
         10) Auxiliary Communications Port: included
         11) Local OLED Temperature Display: included
         12) Display of Temperature to one decimal place

13) Temperature Setpoint Adjustment included
14) Occupancy Override Function included

c. Auxiliary Communication Port. Each room temperature sensor shall include a terminal jack integral to the sensor assembly. The terminal jack shall be used to connect a portable operator's terminal to control and monitor all hardware and software points associated with the controller. RS-232 communications port shall allow the operator to query and modify operating parameters of the local room terminal unit from the portable operator's terminal.

3. Provide the following options as they are called for in the sequences or on the drawings:
   a. Setpoint Adjustment. The setpoint adjustment function shall allow for modification of the temperature by the building operators. Setpoint adjustment may be locked out, overridden, or limited as to time or temperature through software by an authorized operator at any central workstation, Building Controller, room sensor two-line display, or via the portable operator's terminal.
   b. Override Switch. An override button shall initiate override of the night setback mode to normal (day) operation when activated by the occupant and enabled by building operators. The override shall be limited to two (2) hours (adjustable.) The override function may be locked out, overridden, or limited through software by an authorized operator at the operator interface, Building Controller, room sensor two-line display or via the portable operator's terminal.
   c. Space Combination Temperature and Humidity Sensors. Each controller performing space temperature control shall be provided with a matching room temperature sensor, which also includes the ability to measure humidity for either monitoring or control purposes. The combination temperature and humidity sensors shall have the same appearance as the space temperature sensors. Humidity elements shall measure relative humidity with a +/- 2% accuracy over the range of 10 to 90% relative humidity. Humidity element shall be an IC (integrated circuit) sensing element. Humidity sensing elements shall be removable and field replaceable if needed.

B. Temperature Sensors
   1. All temperature sensors shall meet the following specifications:
      a. Accuracy: Plus or minus 0.2 percent at calibration point.
      b. Wire: Twisted, shielded-pair cable.
      c. Vibration and corrosion resistant
   2. Space temperature sensors shall meet the following specifications:
      a. 10k ohm type 2 thermisters
   3. Insertion Elements in Ducts shall meet the following specifications:
      a. Single point 10k ohm thermister
      b. Use where not affected by temperature stratification
      c. The sensor shall reach more that 1/3 the distance from the duct wall
      d. Junction box for wire splices
   4. Averaging Elements in Ducts shall meet the following specifications:
      a. 72 inches (183 cm) long
      b. Flexible
      c. Use where prone to temperature stratification, in front of coils, or where ducts are larger than 9 sq. ft.
      d. Junction box for wire splices
   5. Insertion Elements for Liquids shall meet the following specifications:
      a. Platinum RTD with 4-20mA transmitter
      b. Threaded mounting with matching well
      c. Brass well with minimum insertion length of 2-1/2 inches for pipes up to 4” diameter
      d. Brass well with insertion length of 6 inches for pipes up to 10” diameter
      e. Junction box for wire splices
   6. Outside-Air Sensors Platinum RTD with 4-20mA transmitter:

a. Watertight enclosure, shielded from direct sunlight
b. Circulation fan
c. Watertight conduit fitting

C. Where called for in the sequences of operations or on the plans, provide the following feature on space sensors and thermostats:
1. Security Sensors: Stainless-steel cover plate with insulated back and security screws
2. Space sensors with setpoint adjust: Plain white plastic cover with slide potentiometer to signal a setpoint adjustment to the DDC
3. Space Sensors with LCD display:
a. Operator buttons for adjusting setpoints, setting fans speeds and overriding unit to on/off
b. Graphical LCD icons for signaling heating/cooling mode, fans speed, schedule mode, actual temperature and current setpoint

D. Humidity Sensors shall meet the following specifications:
1. Bulk polymer sensor element
2. Accuracy: 2 percent full range with linear output
3. Room Sensors: With locking cover matching room thermostats, span of 0 to 100 percent relative humidity
4. Duct and Outside-Air Sensors: With element guard and mounting plate, range of 0 to 100 percent relative humidity

E. Air Static Pressure Transmitter shall meet the following specifications:
1. Non-directional sensor with suitable range for expected input, and temperature compensated.
2. Accuracy: 2 percent of full scale with repeatability of 0.5 percent.
3. Output: 4 to 20 mA.
4. Building Static-Pressure Range: 0 to 0.25 inches wg.
5. Duct Static-Pressure Range: 0 to 5 inches wg.

F. Pressure Transmitters: Direct acting for gas, liquid, or steam service; range suitable for system; proportional output 4 to 20 mA.

G. Equipment operation sensors as follows:
1. Status Inputs for Fans: Differential-pressure switch with adjustable range of 0 to 5 inches wg.
2. Status Inputs for Pumps: Differential-pressure switch piped across pump with adjustable pressure-differential range of 8 to 60 psig.
3. Status Inputs for direct drive electric motors: Current-sensing relay with current transformers, adjustable and sized for 175 percent of rated motor current.
4. Status inputs for belt drive electric motors: Current sensing transmitter with linear 4-20mA output

H. Electronic Valve/Damper Position indication: Visual scale indicating percent of travel and 0 to 10 V dc, feedback signal.

I. Water-Flow Switches: Pressure-flow switches of bellows-actuated mercury or snap-acting type, with appropriate scale range and differential adjustment, with stainless-steel or bronze paddle. For chilled-water applications, provide vapor proof type.

J. Air Differential Pressure Switches: Diaphragm type air differential pressure switches with die cast aluminum housing, adjustable setpoint, minimum 5 amp switch rating at 120VAC, SPDT switches, and the switch pressure range shall be suited for the application. Provide Dwyer or equal. These switches shall be utilized for filter status.

K. Leak detectors: Provide spot leak detectors that can be secured to the floor or secured to a drain pan. The detection shall used a microchip controlled energized probes. The detector shall operate on 24Vor less. Provide a way to adjust the height of the leak probes. The SPDT contacts shall be inside a watertight enclosure.

2.14 ELECTRO-MECHANICAL THERMOSTATS

A. Fire-Protection Thermostats: UL listed with fixed or adjustable settings to operate at not less than 75 deg F above normal maximum operating temperature, with the following:
   1. Reset: Automatic with control circuit arranged to require manual reset at central control panel, with pilot light and reset switch on panel labeled to indicate operation.

B. Electric Low-Limit Duct Thermostat: Snap-acting, single-pole, single-throw, manual- or automatic-reset switch that trips if temperature sensed across any 12 inches of bulb length is equal to or below set point. Setpoint shall be adjustable.
   1. Bulb Length: Minimum 20 feet.
   2. Quantity: One thermostat for every 20 sq. ft. of coil surface.

C. Electric space thermostats: Provide a charged element type stat with snap acting SPDT switch. The switch shall be rated for 16A or 1HP at 120V.

D. Aquastat: Provide a charged element type stat with snap acting SPDT switch. The switch shall be rated for 16A or 1HP at 120V.

2.15 DUCT SMOKE DETECTORS

A. Furnished and installed under separate specification sections. BAS to monitor auxiliary contacts on duct detectors for air handling equipment with greater than 2000 cfm (or smaller systems with common airspace service that exceed 2000 cfm in aggregate) service and program for unit shutdown on alarm.

2.16 AUTOMATIC CONTROL VALVES

A. General:
   1. All automatic control valves shall be fully proportioning, unless specified otherwise. The valves shall be quiet in operation and fail-safe in either normally open or normally closed position in the event of control air failure. All valves shall be capable of operating at varying rates of speed to correspond to the exact dictates of the controllers and variable load requirements. The valves shall be capable of operating in sequence with other valves and/or dampers when required by the sequence of operation. All control valves shall be sized by the control vendor and shall be guaranteed to accommodate the flow rates as scheduled. All control valves shall be suitable for the pressure conditions and shall close against the differential pressures involved. Body pressure rating and connection type construction shall conform to fitting and valve schedules. Control valve operators shall be sized to close against a differential pressure equal to the design pump heads plus 10 percent.
   2. Cold water, hot water and steam valves, throttling type, and bypass valves shall have equal percentage flow characteristics.
   3. Unless otherwise specified, control valves 2 inches and smaller shall have cast iron or bronze bodies with screwed NPT connections.
   4. Valves between 2-1/2 inch and 4 inch shall have cast iron bodies with flanged connections.
   5. All automatic control valves installed exposed to the elements shall be provided with electric actuators with operating characteristics and accessories as described in herein. Coordinate for power availability and point of connection.

6. All automatic control valves controlled by the BAS shall be furnished by the contractor unless noted otherwise in these documents.
7. All automatic control valves shall be installed by the mechanical trade.
8. The contractor shall provide wiring as follows:
   a. All line voltage power for electric valve actuators shall be wired by the contractor from the nearest available power panel. Coordinate with electrical trade.
   b. All wiring between the central control system (ATC/BMS) and the valve actuator shall be wired by the contractor.
   c. All wiring between the valve actuator and their associated thermostats, pressure switches, control devices, etc. shall be wired by the contractor.
   d. All wiring shall comply with code requirements. Segregate high and low voltage wiring & circuits and segregate the FAS and controls (BMS) terminals.

B. Control Valves
1. Single-seated.
2. Fully proportioning with modulating plug or V-port inner valves.
3. Body pressure rating and connection type construction shall conform to fitting and valve schedules. The ANSI rating of the valve shall match the ANSI rating of the piping in which the valve is installed. Minimum ANSI rating shall be ANSI 125.
4. Stainless steel stems and trim.
5. Spring loaded Teflon packing
6. Quiet in operation.
7. Fail-safe in either normally open or normally closed position in the event of power failure.
8. Capable of operating in sequence with other valves and/or dampers when required by the sequence of operation.
9. Capable of operating at varying rates of speed to correspond to the exact dictates of the controller and variable load requirements.

C. Differential Pressure Control Valves :
1. Provide for all water systems where modulating water flow conditions are required to prevent excessive pump pressure build-up. Provide a valve for each closed loop water system. Valve to be globe type. Provide valves 2" and smaller with screwed end bodies and provide valves 2-1/2" and larger with flanged ends.

D. Butterfly Valves
1. Furnish automatic butterfly valves for isolation requirements as shown on the drawings or required herein.
2. Butterfly valves shall have body ratings in accordance with the piping specifications.
3. Valves that are in high static locations or where flanges are ANSI300 per the piping design shall be high performance, fully lugged with carbon steel body ANSI 300 as required by pipe specifications.
4. Valves that are in locations where ANSI150 flanges are allowed shall be ANSI 150 valves.
5. Valves shall be bubble tight with 316 stainless steel disc, stainless steel shaft and reinforced Teflon seat.
6. Actuators shall be fail in place with factory mounted open and closed position limit switches mounted.
7. Provide fail in place, electric actuators with waterproof enclosure and crankcase heater for actuator and accessories mounted outside.
8. Provide manual override hand wheels for each valve.
9. Butterfly valves will only be approved for cooling tower bypass and all two-position (open or close) applications.
10. Valves must have full lug type body connections.

2.17 ELECTRONIC ACTUATOR SPECIFICATION

A. Electronic Valve Actuators

1. Actuator shall be fully modulating, floating (tri-state), two position, and/or spring return as indicated in the control sequences. Specified fail safe actuators shall require mechanical spring return.
2. Modulating valves shall be positive positioning, responding to a 2-10VDC or 4-20mA signal. There shall be a visual valve position indicator.
3. The actuator shall have the capability of adding auxiliary switches or feedback potentiometer if specified.
4. Actuator shall provide minimum torque required for proper valve close-off. The actuator shall be designed with a current limiting motor protection. A release button (clutch) or handle on the actuator shall be provided to allow for manual override (except when actuator is spring return type).
5. Actuators shall be UL listed.

B. Electronic Damper Actuators
1. Actuator shall be direct coupled (over the shaft), enabling it to be mounted directly to the damper shaft without the need for connecting linkage. The actuator-to-shaft clamp shall use a "V" bolt and "V" shaped, toothed cradle to attach to the damper shaft for maximum holding strength. Single bolt or set screw type fasteners are not acceptable.
2. Actuator shall have electronic overload or digital rotation sensing circuitry to prevent damage to the actuator throughout the rotation of the actuator. End switches to deactivate the actuator at the end of rotation or magnetic clutch are not acceptable.
3. For power-failure/safety applications, a mechanical, spring return mechanism shall be used.
4. Actuators with spring return mechanisms shall be capable of either clockwise or counterclockwise spring return operation by simply changing the mounting orientation.
5. Proportional actuators shall accept a 2-10VDC, 4-20mA signal, or be of the 2 point floating type and provide a 2-10VDC actuator position feedback signal.
6. All actuators shall have an external manual gear release (clutch) or manual crank to aid in installation and for allowing manual positioning when the actuator is not powered.
7. All actuators shall have an external direction of rotation switch to aid in installation and to allow proper control response.
8. Actuators shall be provided with a factory-mounted 3-foot electrical cable and conduit fitting to provide easy hook-up to an electrical junction box.
9. Actuators shall be listed under Underwriters Laboratories Standard 873 and Canadian Standards Association. They must be manufactured under ISO 9001.

PART 3 - EXECUTION

3.01 EXAMINATION

A. The project plans shall be thoroughly examined for control device and equipment locations. Any discrepancies, conflicts, or omissions shall be reported to the architect/engineer for resolution before rough-in work is started.

B. The contractor shall inspect the site to verify that equipment may be installed as shown. Any discrepancies, conflicts, or omissions shall be reported to the engineer for resolution before rough-in work is started.

C. The contractor shall examine the drawings and specifications for other parts of the work. If head room or space conditions appear inadequate—or if any discrepancies occur between the plans and the contractor’s work and the plans and the work of others—the contractor shall report these discrepancies to the engineer and shall obtain written instructions for any changes necessary to accommodate the contractor’s work with the work of others.

3.02 INSTALLATION

A. Provide all relays, switches, sources of emergency and UPS battery back-up electricity and all other auxiliaries, accessories and connections necessary to make a complete operable system in accordance with the sequences specified. All field wiring shall be by this contractor.

B. Install controls so that adjustments and calibrations can be readily made. Controls are to be installed by the control equipment manufacturer.

C. Mount surface-mounted control devices on brackets to clear the final finished surface on insulation.

D. Install equipment level and plumb.

E. Install control valves horizontally with the power unit up.

F. Unless otherwise noted, install wall mounted thermostats and humidistat 60” above the floor measured to the center line of the instrument, or as otherwise directed by the Architect.

G. Install averaging elements in ducts and plenums in horizontal crossing or zigzag pattern.

H. Install outdoor sensors in perforated tube and sunshield.

I. Install damper motors on outside of duct in protected areas, not in locations exposed to outdoor temperatures.

J. Install labels and nameplates on each control panel listing the name of the panel referenced in the graphics and a list of equipment numbers served by that panel.

K. Furnish hydronic instrument wells, valves, and other accessories to the contractor for installation.

L. Furnish automatic dampers to contractor for installation.

3.03 ELECTRICAL WIRING SCOPE

A. The contractor shall be responsible for power that is not shown on the electrical drawings, to controls furnished by the contractor. If power circuits are shown on the electrical drawings, the contractor shall continue the power run to the control device. If power circuits are not shown, the contractor shall coordinate to provide breakers at distribution panels for power to controls. This contractor is then responsible for power from the distribution panel.
   1. Coordinate panel locations. If enclosures for panels are shown on the electrical drawings, furnish the enclosures according to the electrician’s installation schedule.

B. This contractor shall not be responsible for power to control panels and control devices that are furnished by others, unless it is part of the control interlock wiring.

C. The contractor shall be responsible for wiring of any control device that is furnished as part of this section of specification.

D. Wiring for controls furnished by others:
   1. Provide control wiring for HVAC controls furnished by others. Wiring may include, but not limited to, the following items:
      a. Thermostats
      b. Condensers
      c. Chiller control devices shipped loose
      d. Leak detectors

e. Humidifier controls
f. Refrigerant leak monitoring systems
g. Exhaust or Purge fans
h. Manual switches for HVAC equipment (not shown on electrical drawings)
i. Emergency ventilation switches (not shown on electrical drawings)
j. Emergency shutdown switches (not shown on electrical drawings)

2. Provide control wiring for the following non-HVAC controls furnished by others if they are called for in this project:
   a. Electrical vault fans
   b. Emergency generator dampers
   c. Water treatment
   d. Interlock to fire suppression system
   e. Leak detection system
   f. Fuel oil monitoring system
   g. Fuel oil fill system

E. Interlock wiring shall be run in separate conduits from BAS associated wiring.

F. Provide network wiring for equipment that is called to be integrated to the BAS.

3.04 ELECTRICAL WIRING AND CONNECTION INSTALLATION

A. All low voltage control wiring shall be class 2. Control wiring that is not class 2 shall be run in separate conduits from class 2 wiring.

B. Floor level network wiring between terminal units can be combined with thermostat and other low voltage wiring in the same conduit. All other network wiring shall be in dedicated conduits.

C. Install raceways, boxes, and cabinets according to Division 26 Section "Raceways and Boxes."

D. Install building wire and cable according to Division 26 Section "Conductors and Cables."

E. Installation shall meet the following requirements:
1. Conceal cable and conduit, except in mechanical rooms and areas where other conduit and piping are exposed.
2. Install exposed cable in raceway or conduit.
3. Install concealed cable using plenum rated cable, not in conduit.
4. Bundle and harness multiconductor instrument cable in place of single cables where several cables follow a common path.
5. Fasten flexible conductors, bridging cabinets and doors, along hinge side; protect against abrasion. Tie and support conductors.
6. Number-code or color-code conductors for future identification and service of control system, except local individual room control cables.
7. All wiring above T-Bar ceilings shall be plenum rated cable, not in conduit.
8. All unsupported risers shall be rigid steel conduit. Supported risers shall be EMT.

F. Rigid conduit shall be steel, hot dip galvanized, threaded with couplings, ¾ inch minimum size, manufactured in accordance with ANSI C-80-1. Electrical metallic tubing (EMT) with compression fittings or intermediate metallic conduit (IMC) may be used as conduit or raceway where permitted by the NEC.

G. Concealed control conduit and wiring shall be provided in all spaces except in the Mechanical Equipment Rooms and in unfinished spaces. Install in parallel banks with all changes in directions made at 90 degree angles.

H. Install conduit adjacent to machine to allow service and maintenance.

I. Connect manual-reset limit controls independent of manual-control switch positions. Automatic duct heater resets may be connected in interlock circuit of power controllers.

J. Connect hand-off-auto selector switches to override automatic interlock controls when switch is in hand position.

K. Ground equipment.

3.05 COMMUNICATION WIRING

A. All cabling shall be installed in a neat and workmanlike manner. Follow manufacturer's installation recommendations for all communication cabling.

B. Do not install communication wiring in raceway and enclosures containing Class 1 wiring.

C. Maximum pulling, tension, and bend radius for cable installation, as specified by the cable manufacturer, shall not be exceeded during installation.

D. Contractor shall verify the integrity of the entire network following the cable installation. Use appropriate test measures for each particular cable.

E. Cable bundling:
1. RS485 cabling run open air in accessible areas can be bundled with other class 2 low voltage cabling.
2. RS485 cabling run between terminal units in conduits above ceilings or under floors or in inaccessible areas can be bundled with other class 2 low voltage cabling.
3. RS485 cabling run between floors shall be in a communication only conduit.
4. RS485 conduit run long distances between utility rooms or between buildings shall be in a communication only conduit.
5. Ethernet cabling shall be in a communication only conduit.
6. Ethernet and RS485 can be run together.
7. Fiber optics can be run with Ethernet and RS485 cabling as long as the conduit is bent to fiber optic standards and junction boxes are sized for fiber optic use.

F. FLN or BACnet BACnet MS/TP Cabling
1. RS485 cabling shall be used for BACnet MS/TP networks.
2. RS485 shall use low capacitance, 20-24 gauge, twisted shielded pair.
3. The shields shall be tied together at each device.
4. The shield shall be grounded at one end only and capped at the other end.
5. Provide end of line (EOL) termination devices at each end of the RS485 network or subnetwork run, to match the impedance of the cable, 100 to 120ohm.

G. Ethernet Cabling
1. Ethernet shall not be run with any Class 1 or low voltage Class 2 wiring.
2. CAT6, unshielded twisted pair (UTP) cable shall be used for BAS Ethernet. **Cable shall be orange**.
3. Solid wire shall be used for long runs, between mechanical rooms and between floors. Stranded cable can be used for patch cables and between panels in the same mechanical room up to 50 feet away.
4. When the BAS Ethernet connects to an Owner's network switch, document the port number on the BAS As-builts.

H. When a cable enters or exits a building, a lightning arrestor must be installed between the lines and ground. The lighting arrestor shall be installed according to the manufacturer's instructions.

I. All runs of communication wiring shall be unspliced length when that length is commercially available.

J. All communication wiring shall be labeled to indicate origination and destination data.

K. Grounding of coaxial cable shall be in accordance with NEC regulations article on "Communications Circuits, Cable, and Protector Grounding."

3.06 FIBER OPTIC CABLE SYSTEM:

A. Maximum pulling tensions as specified by the cable manufacturer shall not be exceeded during installation. Post-installation residual cable tension shall be within cable manufacturer's specifications.

B. All cabling and associated components shall be installed in accordance with manufacturers' instructions. Minimum cable and unjacketed fiber bend radii, as specified by cable manufacturer, shall be maintained.

C. All terminations shall to be made into a patch panel, designed for such use. Free air terminations with patch panels are prohibited.

3.07 IDENTIFICATION

A. Permanent warning labels shall be affixed to all equipment that can be automatically started by the DDC system.
   1. Labels shall use white lettering (12-point type or larger) on a red background.

B. Permanent warning labels shall be affixed to all motor starters and all control panels that are connected to multiple power sources utilizing separate disconnects.
   1. Labels shall use white lettering (12-point type or larger) on a red background.

C. Control Equipment and Device labeling:
   1. Labels and tags shall match the unique identifiers shown on the as-built drawings.
   2. All Enclosures shall be labeled to match the as-built drawing by either control panel name or the names of the DDC controllers inside.
   3. All sensors and actuators not in occupied areas shall be tagged.
   4. Airflow measurement arrays shall be tagged to show flow rate range for signal output range, duct size, and pitot tube AFMS flow coefficient.
   5. Duct static pressure taps shall be tagged at the location of the pressure tap.
   6. Each device inside enclosures shall be tagged.
   7. Terminal equipment need only have a tag for the unique terminal number, not for each device. Match the unique number on:
      a. First, the design drawings, or
      b. Second, the control as-builts, or
      c. Third, the DDC addressing scheme
   8. Tags on the terminal units shall be displayed on the Operator Workstation Graphics.

D. Tags shall be mechanically printed on permanent adhesive backed labeling strips, 12 point height minimum.

E. Manufacturers' nameplates and UL or CSA labels are to be visible and legible after equipment is installed.

F. Identification of Wires
   1. Tag each wire with a common identifier on each end of the wire, such as in the control panel and at the device termination.
   2. Tag each network wire with a common identifier on each end.
   3. Tag each 120V power source with the panel and breaker number it is fed by.

G. Identification of Conduits:
   1. Identify the low voltage conduit runs as BAS conduit, power feeds not included.
   2. Identify each electric box, junction box, utility box and wiring tray with a blue paint mark or blue permanent adhesive sticker.
   3. For conduit runs that run more than 8 ft between junction boxes in 1 room, place a blue identifier at least every 8 feet.
   4. Place a blue identifier on each side of where a conduit passed through a wall or other inaccessible path.
   5. Identify all BAS communication conduits the same as above.

3.08 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including piping and electrical connections. Report results in writing.
   1. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation. Remove malfunctioning units, replace with new units, and retest.
   2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment, and retest.
   3. Calibration test controllers by disconnecting input sensors and stimulating operation with compatible signal generator.

3.09 SYSTEM CHECKOUT AND STARTUP

A. Inspect each termination in the BAS control panels and devices to make sure all wires are connected according to the wiring diagrams and all termination are tight.

B. After the controls devices and panels are installed and power is available to the controls, perform a static checkout of all the points, including the following:
   1. Inspect the setup and reading on each temperature sensor against a thermometer to verify its accuracy.
   2. Inspect the setup and reading on each humidity sensor against a hygrometer to verify its accuracy.
   3. Inspect the reading on each CO2 sensor using a calibration kit to verify the sensor range accuracy matches the DDC setup.
   4. Inspect the reading of each status switch to verify the DDC reads the open and close correctly.
   5. Command each relay to open and close to verify its operation.
   6. Command each 2-position damper actuator to open and close to verify operation.
   7. Command each 2-position valve to open and close to verify operation.
   8. Ramp each modulating actuator to 0%, 25%, 50%, 75% and 100% to verify its operation.
   9. Ramp each modulating output signal, such as a VFD speed, to verify its operation.
   10. Test each safety device with a real life simulation, for instance check freezestats with ice water, water detectors with water, etc.

C. Document that each point was verified and operating correctly. Correct each failed point before proceeding to the dynamic startup.

D. Verify that each DDC controller communicates on its respective network correctly.

E. After all of the points are verified, and power is available to the mechanical system, coordinate a startup of each system. Include the following tests:
   1. Start systems from DDC.
   2. Verify that each setpoint can be met by the system.
   3. Change setpoints and verify system response.
   4. Change sensor readings to verify system response.
   5. Test safety shutdowns.
   6. Verify time delays.
   7. Verify mode changes.
   8. Adjust filter switches and current switches for proper reactions.
   9. Adjust proportional bands and integration times to stabilize control loops.

F. Perform all program changes and debugging of the system for a fully operational system.

G. Verify that all graphics at the operator workstations correspond to the systems as installed. Verify that the points on the screens appear and react properly. Verify that all adjustable setpoints and manual commands operate from the operator workstations.

H. After the sequence of operation is verified, setup the trends that are listed in the sequence of operations for logging and archiving for the commissioning procedure.

3.10 SYSTEM COMMISSIONING, DEMONSTRATION AND TURNOVER

A. The BAS Vendor shall prepare and submit for approval a complete acceptance test procedure including submittal data relevant to point index, functions, sequence, inter-locks, and associated parameters, and other pertinent information for the operating system. Prior to acceptance of the BAS by the Owner and Engineer, the BAS Vendor shall completely test the BAS using the approved test procedure.

B. After the BAS Vendor has completed the tests and certified the BAS is 100% complete, the Engineer shall be requested, in writing, to approve the satisfactory operation of the system, sub-systems and accessories. The BAS Vendor shall submit Maintenance and Operating manuals at this time for approval. An acceptance test in the presence of the Engineer and Owner's representative shall be performed. The Owner will then shake down the system for a fixed period of time (30 days).

C. The BAS Vendor shall fix punch list items within 30 days of acceptance.

   When the system performance is deemed satisfactory in whole or in part by these observers, the system parts will be accepted for beneficial use and placed under warranty.

3.11 PROJECT RECORD DOCUMENTS

A. Project Record Documents: Submit three (3) copies of record (as-built) documents upon completion of installation. Submittal shall consist of:
   1. Project Record Drawings. As-built versions of the submittal shop drawings provided as AutoCAD compatible files in electronic format and as 11 x 17 inch prints.
   2. Testing and Commissioning Reports and Checklists. Completed versions of reports, checklists, and trend logs used to meet requirements in the Control System Demonstration and Acceptance section of this specification.
   3. Operation and Maintenance (O & M) Manual.
      a. As-built versions of the submittal product data.
      b. Names, addresses, and 24-hour telephone numbers of installing contractors and service representatives for equipment and control systems.

c. Operator's Manual with procedures for operating control systems, logging on and off, handling alarms, producing point reports, trending data, overriding computer control, and changing setpoints and variables.
d. Programming manual or set of manuals with description of programming language and of statements for algorithms and calculations used, of point database creation and modification, of program creation and modification, and of editor use.
e. Engineering, installation, and maintenance manual or set of manuals that explains how to design and install new points, panels, and other hardware; how to perform preventive maintenance and calibration; how to debug hardware problems; and how to repair or replace hardware.
f. Documentation of all programs created using custom programming language, including setpoints, tuning parameters, and object database.
g. Graphic files, programs, and database on electronic media.
h. List of recommended spare parts with part numbers and suppliers.
i. Complete original-issue documentation, installation, and maintenance information for furnished third-party hardware, including computer equipment and sensors.
j. Complete original original-issue copies of furnished software, including operating systems, custom programming language, operator workstation software, and graphics software.
k. Licenses, guarantees, and warranty documents for equipment and systems.

B. Operating manual to serve as training and reference manual for all aspects of day-to-day operation of the system. As a minimum include the following:
1. Sequence of operation for automatic and manual operating modes for all building systems. The sequences shall cross-reference the system point names.
2. Description of manual override operation of all control points in system.
3. BMS system manufacturers complete operating manuals.

C. Provide maintenance manual to serve as training and reference manual for all aspects of day-to-day maintenance and major system repairs. As a minimum include the following:
1. Complete as-built installation drawings for each building system.
2. Overall system electrical power supply schematic indicating source of electrical power for each system component. Indicate all battery backup provisions.
3. Photographs and/or drawings showing installation details and locations of equipment.
4. Routine preventive maintenance procedures, corrective diagnostics troubleshooting procedures, and calibration procedures.
5. Parts list with manufacturer's catalog numbers and ordering information.
6. Lists of ordinary and special tools, operating materials supplies and test equipment recommended for operation and servicing.
7. Manufacturer's operation, set-up, maintenance and catalog literature for each piece of equipment.
8. Maintenance and repair instructions.
9. Recommended spare parts.

D. Provide Programming Manual to serve as training and reference manual for all aspects of system programming. As a minimum include the following:
1. Complete programming manuals, and reference guides.
2. Details of any custom software packages and compilers supplied with system.
3. Information and access required for independent programming of system.

3.12 TRAINING

A. During System commissioning and at such time as acceptable performance of the Building Automation System hardware and software has been established, the BAS Vendor shall provide on-site operator instruction to the owner's operating personnel. Operator instruction during normal working hours shall be performed by a competent building automation contractor

representative familiar with the Building Automation System's software, hardware and accessories.

B. At a time mutually agreed upon, during System commissioning as stated above, the BAS contractor shall give 16-hours of onsite training on the operation of all BAS equipment. Describe its intended use with respect to the programmed functions specified. Operator orientation of the automation system shall include, but not be limited to:
   1. Explanation of drawings and operator's maintenance manuals.
   2. Walk-through of the job to locate all control components.
   3. Operator workstation and peripherals.
   4. DDC Controller and ASC operation/sequence.
   5. Operator control functions including scheduling, alarming, and trending.
   6. Explanation of adjustment, calibration and replacement procedures.

C. Additional 8-hours of training shall be given after the 30 day shakedown period.

D. Since the Owner may require personnel to have more comprehensive understanding of the hardware and software, additional training must be available from the Contractor. If the Owner requires such training, it will be contracted at a later date. Provide description of available local and factory customer training. Provide costs associated with performing training at an off-site classroom facility and detail what is included in the manufacturer's standard pricing such as transportation, meals, etc.

3.13 SEQUENCE OF OPERATIONS

A. General:
   1. The DDC system shall:
      a. Monitor zone and system demand for fan pressure, heating and cooling. All system temperatures, setpoints, positions, enable commands, fan speeds, schedules, trends, alarms, and statuses shall be accessible from the city front end.
      b. Transfer zone and system demand information from zones to air distribution system controllers and from air distribution system to heating and cooling controllers.
      c. Automatically detect the zone and systems that may be excessively driving the rest logic and generate an alarm or other indication to the BMS.
      d. Readily allow operator removal of zones from the rest algorithm.
      e. Trend and graphically display input and output points
      f. Reset heating and cooling setpoints in all noncritical zones upon receipt of a signal from a future demand response signal. Coordinate with owner at time of potential future activation on list of critical zones.
      g. See additional noted on **M-501** through **M-503, including, but not limited to;**
         1) Occupancy integrations via the lighting controls system – via a BACnet connection for the VRF systems occupied standby mode functionality.
         2) BACnet interface points lists

B. Universal control strategies required on most systems:
   1. Low ambient temperature safeties will be allowed to auto reset 3 times and then be locked in alarm mode by the DDC with critical alarm sent to the operators work station.
   2. During low ambient outside air conditions all dual duct vav heating damper positions will be opened 30% (adj.)
   3. The stagger start of air handlers will be limited to air handlers only and not include vav boxes
   4. Graphical charts of vav boxes will identify the vav box with vav box numerical number and the room or multiple rooms served

C. AC-1/AC-2 – cooling only vav packaged rooftop units (see also 23 74 16.13)

1. Supply fan control: the variable speed supply fan will be started based on a schedule adjustable through the BMS by the building operator. When the supply fan status indicates the fans started, the control sequence will be enabled. The supply fan will modulate static pressure 2/3 of the way down the duct. Upon a loss of airflow the fan will attempt to automatically restart until positive status is received. The fans status will be displayed on the building automation system.

2. Relief fan control: after the supply fan has been started, the variable speed relief fan will be started. The relief fan shall modulate to maintain a zone pressure setpoint. The fans status will be displayed on the building automation system.

3. Automatic shutdown: a smoke detector shall be provided by div. 26. The smoke detector shall contain fire alarm contacts which will be used by the BMS to interlock the unit such that if smoke is detected, the unit will automatically shut off.

4. Temperature control: the unit will control to maintain a constant discharge air temperature, as reset by zone demand. If the zone temperature becomes unreliable, the unit will revert to a reset from return air temperature.

5. Free cooling mode: the unit controller will modulate the economizer from minimum position to 100% to maintain the setpoint. If the economizer is unable to meet the cooling demand after the OA damper is 100% open for a period of time, the unit activates mechanical cooling. Outside air at the AC unit shall be measured by a manufacturer provided and installed outside air measuring station.

6. Demand controlled ventilation: the outside air damper will adjust to maintain the outside air levels required by the zonal co2 sensors. Airflow through the outside air damper will adjust based on the cfm values listed in the mechanical schedules.

7. Mechanical cooling mode: the cooling coil will be staged in sequence to maintain the temperature setpoint as reset by zone demand. The unit will provide stages of mechanical cooling based on the three constant speed compressors and the single variable speed compressor, per the manufacturer provided controller.

8. Pre-occupancy purge: the design rate of outdoor air as listed on the mechanical schedules shall be supplied to the entire building during the one-hour period immediately before the building is normally occupied.

9. Isolation area controls: the air handler shall have isolation dampers on each floor to isolate the floor from the supply distribution system. The front end of the BMS system shall have a control point to activate each floor individually (4 total dampers).

10. Additional points to monitor: in addition to the points required for the BMS to command the unit in the sequence provided, the BMS shall monitor the following points from the manufacturer provided controller:

    a. AI – outside air cfm
    b. AI – supply air temperature
    c. AI – return air temperature
    d. AI – supply duct pressure
    e. AI – relief fan control

11. Reference also detail 3/M-501.

D. CAH-1/CAH-2 & ACCU-1/ACCU-2 – cooling only semi-custom vav air handler split system rooftop units (see also 23 63 13 & 23 73 43.16)

1. Supply fan control: the variable speed supply fan will be started based on a schedule adjustable through the BMS by the building operator. When the supply fan status indicates the fans started, the control sequence will be enabled. The supply fan will modulate static pressure 2/3 of the way down the duct. Upon a loss of airflow the fan will attempt to automatically restart until positive status is received. The fans status will be displayed on the building automation system.

2. Return fan control: after the supply fan has been started, the variable speed return fan will be started. The return fan shall modulate to maintain a speed based on an offset of the supply fan speed (fan tracking) and zone pressure setpoints on each floor. The fans status will be displayed on the building automation system.

3. Automatic shutdown: a smoke detector shall be provided by div. 26. The smoke detector shall contain fire alarm contacts which will be used by the BMS to interlock the unit such that if smoke is detected, the unit will automatically shut off.

4. Temperature control: the unit will control to maintain a constant discharge air temperature, as reset by zone demand. If the zone temperature becomes unreliable, the unit will revert to a reset from return air temperature.

5. Free cooling mode: the unit controller will modulate the economizer from minimum position to 100% to maintain the setpoint. If the economizer is unable to meet the cooling demand after the OA damper is 100% open for a period of time, the unit activates mechanical cooling. Outside air at the CAH unit shall be measured by a manufacturer provided and installed outside air measuring station.

6. Demand controlled ventilation: the outside air damper will adjust to maintain the outside air levels required by the zonal co2 sensors. Airflow through the outside air damper will adjust based on the cfm values listed in the mechanical schedules.

7. Mechanical cooling mode: the cooling coil will be staged in sequence to maintain the temperature setpoint as reset by zone demand. The unit will provide stages of mechanical cooling based on the six constant speed compressors, as controlled by the field provided controller.

8. Pre-occupancy purge: the design rate of outdoor air as listed on the mechanical schedules shall be supplied to the entire building during the one-hour period immediately before the building is normally occupied.

9. Isolation area controls: the air handler shall have isolation dampers on each floor to isolate the floor from the supply distribution system. The front end of the BMS system shall have a control point to activate each floor individually (4 total dampers).

10. Reference also detail 4/M-501.

E. HAU-1/HAU-2 – gas heating vav rooftop air handler (see also 23 73 43.16)

1. Supply fan control: the variable speed supply fan will be started based on a schedule adjustable through the BMS by the building operator. When the supply fan status indicates the fans started, the control sequence will be enabled. The supply fan will modulate static

pressure 2/3 of the way down the duct. Upon a loss of airflow the fan will attempt to automatically restart until positive status is received. The fans status will be displayed on the building automation system.

2. Automatic shutdown: a smoke detector shall be provided by div. 26. The smoke detector shall contain fire alarm contacts which will be used by the BMS to interlock the unit such that if smoke is detected, the unit will automatically shut off.

3. Temperature control: the unit will control to maintain a constant discharge air temperature, as reset by zone demand. If the zone temperature becomes unreliable, the unit will revert to a reset from return air temperature.

4. Heating mode: the gas heating furnace will be staged in sequence to maintain the temperature setpoint as reset by zone demand. The unit will provide stages of 20:1 turndown ratio in the modulating furnace, as controlled by the field provided controller.

5. Isolation area controls: the air handler shall have isolation dampers on each floor to isolate the floor from the supply distribution system. The front end of the BMS system shall have a control point to activate each floor individually (8 total isolation dampers).

6. Reference also detail 1/M-502.

F. Dual duct vav boxes

1. Program control: the dual duct vav box units will start at the occupied mode as determined by the building management system.

2. Damper control: the dual duct vav box controller sense room temperature and shall rest the box cfm setpoint, modulating between min and max range as listed per the mechanical schedules. The unit shall maintain the temperatures below:

   All spaces (excluding electrical rooms):
   a. Cooling occupied: 75°F (ADJ)
   b. Cooling unoccupied: 77°F (ADJ)
   c. Cooling night setback: 90°F (ADJ)
   d. Heating occupied: 68°F (ADJ)
   e. Heating unoccupied: 66°F (ADJ)
   f. Heating night setback: 55°F (ADJ)

   Electrical rooms:
   g. Cooling: 85°F (ADJ)
   h. Cooling alarm temp: 90°F (ADJ)
   i. Heating occupied: N/A
   j. Heating unoccupied: N/A
   k. Heating night setback: N/A

3. Demand controlled ventilation (where noted per plans):
   Demand ventilation controls shall maintain co2 concentrations less than or equal to 600 ppm plus the outdoor air co2 concentration (assumed to be 400 ppm). When the system is operating during hours of expected occupancy, the controls shall maintain system outdoor air ventilation rates no less than the rate listed in the mechanical schedules. The co2 sensor(s) reading for each zone shall be displayed continuously, and shall be recorded on the BMS for each applicable zone.

4. Occupied standby mode: the vav box shall go into occupied-standby mode as controlled by a field provided lighting control relay, when all spaces served by the vav box have been unoccupied for at least five minutes. The vav box cooling setpoints shall be adjusted as previously defined. The vav box shall have its dampers close completely (no airflow provided to the zone) when in occupied standby mode and the zone temperature is thermostatically satisfied. See detail 2/M-502.

END OF SECTION

SECTION 23 11 23
FACILITY NATURAL GAS PIPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The requirements of the GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS, SPECIAL CONDITIONS and DIVISION 1 GENERAL REQUIREMENTS, apply to the work of this section.

B. Section 23 05 00 applies to this section.

1.02 SUMMARY

A. This section includes all plumbing (equipment, fixtures, pipe and fittings, specialties) inside the building(s) and outside the building(s) to the point of connection to site plumbing systems.

B. Provide complete plumbing systems including:
   1. Service connections to existing on-site utilities for connection to equipment provided under the work of this Section or other Sections of the Specifications.
   2. All piping systems for conduction of natural gas as shown or specified for plumbing work.
   3. All valves, piping supports, piping penetration auxiliaries, piping protective coverings, piping, and other piping accessories as shown or specified for plumbing work.
   4. All plumbing equipment and auxiliary items as specified herein or shown on the drawings.

1.03 RELATED SECTIONS

A. Section 23 00 00 - HVAC

B. Section 22 00 00- Plumbing

1.04 QUALITY ASSURANCE

A. All plumbing fixtures and equipment shall comply with California Code of Regulations, Title 24, Part 6, latest edition.

1.05 REFERENCES

A. Pipes and Tubes
   1. Steel Pipe: ASTM A53, Type S, Grade A, Schedule 40, seamless, black or galvanized, plain ends.

B. Fittings
   1. Steel Pipe Nipples: ASTM A733, made of ASTM A53 or ASTM A106, Schedule 40, seamless, galvanized, carbon-steel pipe.
   2. Malleable-Iron Unions: ASME B16.39, Classes 150 and 300; hexagonal stock; with ball-and-socket joint; metal-to-metal bronze seating surfaces; and female threaded ends with threads complying with ASME B1.20.1.

1.06 JOINING MATERIALS

A. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

1.07 STRUCTURAL REQUIREMENTS

A. Structural members shall not be cut or modified in any manner without specific instructions from the structural engineer. Where possible, offset vents and pipes rising in walls, concealed above ceilings, below plates and rise through roof. Where this is not possible, install vents and pipes through plates as detailed on structural drawings.

1.08 SUBMITTALS

A. Submit a general statement of materials and methods along with manufacturer's technical data and installation instructions for all equipment, fixtures, pipe and fittings, and plumbing specialties to be installed.

B. Record Drawings: Per specification section 23 05 00 requirements.

C. Operation and Maintenance Manuals: Per specification section 23 05 00 requirements.

PART 2 - PRODUCTS

2.01 GENERAL

A. Adapters: Wrought copper male adapters shall be used wherever it is necessary to connect copper tubing to a valve or "tee" having threaded connections.

2.02 PIPE, FITTING, AND JOINING MATERIALS

A. Steel/Threaded Fittings
   1. Pipe: Black or galvanized steel per ASTM A-53 seamless, threaded ends, standard weight Schedule 40 or Schedule 80.
   2. Fittings:
      a. Black or galvanized (to match pipe) banded malleable iron, threaded, ASTM A-197, 150 lb. standard or 300 lb. extra heavy per ANSI Standard B16.3 (to match pipe schedule).
      b. Black or galvanized (to match pipe) banded cast iron, threaded, per ASTM A-126 Class B, 125 lb. standard or 250 lb. extra heavy per ANSI Standard B16.4 (to match pipe schedule).
      c. Unions: AAR 300 lb. malleable iron, black or galvanized (to match pipe).
      d. Joining Materials/Methods
         1) Rectorseal or pure lead and graphite thread lubricant.
         2) Permacel, P-412, ½" wide teflon pipe joint sealant.

B. Steel/Welding Fittings
   1. Fittings: Black steel, permanently marked, seamless butt welding type, standard weight or extra strong (to match pipe schedule). Optional in lieu of tees where main is at least two pipe sizes larger than branch Bonney Forge, Threadolets for ½" to 2", weldolets for branch lines 2 ½" to 4"; fitting shall suit main size.
   2. Unions: AAR 300 lb. malleable iron, black or galvanized (to match pipe).
   3. Joining Materials/Methods
      a. Gas or electric arc welding per ASME Code for pressure piping.

2.03 PIPE AND FITTING APPLICATIONS

A. Inside Building (to 5'-0" outside building line).
   1. Gas Piping: Schedule 40, black steel pipe; malleable iron screwed fittings for sizes 2" and smaller. Weld sizes 2 ½" and larger. Weld all below grade piping and protect as specified herein.
   2. Plastic pipe and fittings shall not be used inside of buildings.

2.04 VALVES

A. General
   1. Furnish two tee handle operators for each size to suit all valves which are installed below grade in access boxes and which are not fitted with integral handles; hub end valves shall be used where required.
   2. Valves on systems operating over 100 psi shall be rated for 150 lb. or higher as required.

B. Shut-off service, natural gas
   1. Sizes 2" and smaller: NibcoT-585-70-UL, full port ball valve; 400 psi gas service rating; bronze body and ball, teflon seat, quarter turn handle with stops, swing-out accessibility/removal.
   2. Sizes 2 ½" to 4": DeZurik Fig. 425, 175 psi shut-off pressure differential; semi-steel body, threaded ends, eccentric plug with RS-49 facing, Fig. 483 lever handle.

2.05 PIPING ACCESSORIES

A. Unions shall have the same pressure rating as pipe fittings.

2.06 PIPING PENETRATION AUXILIARIES

A. Sleeves Below Slab or Grade: Metraseal model MS or equal with schedule 80 PVC sleeve. The seal shall be capable of withstanding a hydrostatic pressure of 20 psig. The seal shall be constructed of synthetic rubber with heavy-duty plastic pressure plates. All bolts and nuts shall be constructed of stainless steel.

B. Escutcheons: Polished chrome plated brass or painted metal.

PART 3 - EXECUTION

3.01 GAS PIPING

A. Gas Piping: Install generally level with as few bends as possible. Install dirt legs and shut-off valves at each piece of equipment. Support as specified and in accordance with the C.P.C.

3.02 VALVES

A. Valves shall be full size of line in which installed. Furnish discs suitable for service intended. All valves shall be properly packed and lubricated. Unions shall be placed adjacent to each threaded or soldered valve or equipment connection 2" and smaller. Install flanges at all valves with stems vertical wherever possible. Stems shall not be placed below horizontal.

B. Install unions adjacent to each valve and at final connection to each piece of equipment.

C. All shutoff valves in gas lines shall be or ball valves, unless otherwise shown.

D. Valves shall be provided with brass identification tags indicating service controlled. Tags may be omitted on lines exposed in equipment rooms where service is obvious.

3.03 PIPING TESTING: TESTING CRITERIA

System	Medium	Pressure	Duration
Natural Gas	Air	150 psig above grade	4 hours

END OF SECTION

SECTION 23 23 00
REFRIGERANT PIPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The requirements of the GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS, SPECIAL CONDITIONS and DIVISION 1 GENERAL REQUIREMENTS, apply to the work of this section.

B. Section 23 05 00, General Mechanical Requirements applies to this section.

C. Sections 23 05 29, 23 05 48, 23 05 53 and 23 07 19.

1.02 SUMMARY

A. Work Included
   1. Provide complete piping systems for conduction of refrigerant piping and other fluids for HVAC work including all other chemicals required for pipe flushing, cleaning, testing, etc., all as specified or shown on the drawings.

B. Provide all valves, strainers, piping supports, seismic braces, piping penetration auxiliaries, protective coverings, piping insulation, and other piping appurtenances as shown or specified for HVAC work.

C. Installation of sensing and control devices that mount on or insert into piping.

1.03 QUALITY ASSURANCE

A. All HVAC equipment shall comply with California Code of Regulations, Title 24, Part 6, latest edition.

B. Standards: Comply with all applicable codes or standards governing process piping, system materials, application, and installation.

C. Welding Qualifications: Welders shall be certified in accordance with American Welding Society "Standard Qualification Procedure".

1.04 REFERENCES

A. Pipes and Tubes
   1. Hard Copper Tube: ASTM B 88, Types L and M, water tube, drawn temper.
   2. Soft Copper Tube: ASTM B 88, Types K and L, water tube, annealed temper.

B. Fittings
   1. Wrought-Copper, Solder-Joint Pressure Fittings: ASME B16.22.
   2. Cast-Copper-Alloy, Solder-Joint Pressure Fittings: ASME B16.18.
   3. Bronze Flanges: ASME B16.24, Classes 150 and 300.
   4. Copper Unions: ASME B16.18, cast-copper-alloy body, hexagonal stock, with ball-and-socket joint, metal-to-metal seating surfaces, and solder-joint, threaded, or solder-joint and threaded ends. Threads complying with ASME B1.20.1.

C. Joining Materials
   1. Solder Filler Metal: ASTM B 32, alloys to suit system requirements.
   2. Brazing Filler Metals: AWS A5.8, alloys to suit system requirements.

1.05 STRUCTURAL REQUIREMENTS

A. Structural members shall not be cut or modified in any manner without specific instructions from the structural engineer.

PART 2 - PRODUCTS

2.01 PIPE MATERIALS

A. Copper/Soldered Joints
   1. Pipe: Type L, Type K or Type M hard drawn copper tubing per ASTM B-88, plain ends.
   2. Fittings: Solder type, wrought copper per ANSI Standard B16.22 or cast red bronze per ANSI Standard B16.18. Do not use T-drill.
   3. Unions: Solder type, cast red bronze.
   4. Joining Materials/Methods
      a. Canfield, Silvabrite or equal lead free solder with a non-corrosive water based flux.

2.02 REFRIGERANT SYSTEM COMPONENTS

A. Refrigerant Piping (R, RL, RS): Type L, hard copper ACR tubing with silver soldered joints and wrought copper fittings. Do not reduce sizes due to long runs.
   1. Contractor shall have the option to use manufacturer's "Line Sets" for total lengths of lines of 50'-0" from ACCU to coil. Suction lines shall be insulated as hereinbefore specified.
   2. An inverted vapor line trap shall be installed in all systems when the condensing unit is below the furnace or fan coil. The top peak of the trap must be at least one inch higher then the top of the indoor coil.
   3. Install a liquid line solenoid on all systems when the refrigerant lines are installed underground, including all refrigerant lines installed in buried pipes and when the total equivalent line length exceeds 50 feet.
   4. Install a hard start capacitor and relay on all systems, except three-phase systems, when the refrigerant lines are installed underground, including all refrigerant lines installed in buried pipes and when the total equivalent line length exceeds 50 feet. If a factory installed soft start is included with the unit, this must removed prior to installation of the hard start kit.
   5. A suction accumulator must be installed on all systems when the refrigerant lines are installed underground and when the total equivalent line length exceeds 50 feet, including all refrigerant lines installed in buried pipes. The accumulator shall be sized to receive a minimum of 70% of the total system refrigerant charge. The additional refrigerant charge beyond the 15 feet of line included in the unit charge as noted in the nameplate data. Include the additional refrigerant charge due to the larger diameter liquid line.
   6. Install a crankcase heater on all systems when the refrigerant lines are installed underground, including all refrigerant lines installed in buried pipes and when the total equivalent line length exceeds 50 feet.
   7. Install a liquid-line filter drier on all systems when the refrigerant lines are installed underground, including all refrigerant lines installed in buried pipes and when the total equivalent line length exceeds 50 feet.
   8. Install a 5 minute outdoor unit cycle protector on all units.
   9. Install a liquid line sized per manufacturer's instructions on all systems when the equivalent refrigerant line length exceeds 50 feet.

PART 3 - EXECUTION

3.01 INSTALLATION OF REFRIGERANT PIPING

A. Install Bare Metal Pipe Isolators: Stoneman "Trisolator", Superstrut "Cust-aStrip", Unistrut on all non-insulated refrigerant piping.

B. Install pipe supports on the outside of the insulation for all insulated refrigerant piping.

3.02 TESTING OF REFRIGERANT PIPING

A. Test all piping at completion of rough-in, in accordance with the following schedule and show no loss in pressure or visible leaks after a minimum duration of 12 hours at the test pressure indicated. The contractor shall furnish testing equipment. Testing personnel shall be competent to conduct the tests, and demonstrate satisfactory completion of tests to the architect.

System Tested	Test Pressure Psig	Test Medium
Refrigerant – Liquid	250	Nitrogen, let stand 12 hours
Refrigerant – Suction	150 and 28” vacuum	Nitrogen, let stand 12 hours

B. Before covering, concealing, or using the refrigerant piping system or parts thereof, test and prove tight; obtain certification of the inspector that this has been accomplished.

C. Valves and connected equipment or any system component with a pressure rating less than the system test pressure shall not be subjected to the test.

D. If systems are tested in sections, include connections to preceding tested sections in ensuing tests.

E. After producing the specified test pressure, disconnect the pressurizing source; do not introduce further pressure for the duration of the test period. Should any pressure loss or detectable leak occur within test period, repair piping and retest. Repeat the procedure until the system is proved tight.

F. Test all piping as noted above, with no leaks or loss in pressure. Repair or replace defective piping until tests are accomplished successfully

END OF SECTION

SECTION 23 31 13
METAL DUCTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The requirements of the GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS, and DIVISION 1, GENERAL REQUIREMENTS, apply the work in this section.

1.02 SECTION INCLUDES

A. General: Refer to Section 23 05 00, Mechanical - General.

B. Work Included: Provide all ductwork and ductwork accessories, auxiliaries, and adjuncts for all and systems as specified or shown.

C. Work Described Elsewhere: HVAC piping, equipment, and controls are specified in other HVAC Sections.

PART 2 - PRODUCTS

2.01 DUCT WORK

A. Requirements
   1. Shop Fabricated Ductwork
      a. Fabricate ductwork as required by classification as described below or gauges, and of configuration and sizes shown on the Drawings. Note that duct sizes shown are net inside; where ducts are lined, fabricate larger than shown to accommodate lining with shown dimensions net inside lining.
      b. Fabricate ducts and fittings as shown on drawings, or if not detailed, fabricate in accordance with SMACNA.
      c. Fabricate ducts with adequate cross-bracing or reinforcing to prevent drumming; should drumming subsequently occur, provide additional reinforcement as necessary to overcome same.
      d. Construct ducts to provide smooth passage for the conducted air, laying edges exposed to the airstream in the direction of air flow.
      e. Fabricate elbows or other fittings for changing direction of duct with a centerline radius equal to 1.5 times the duct width unless shown otherwise or necessitated by space restrictions. Where square or short radius turns are shown or required, fit with air turning vanes.
      f. Fabricate diverging transitions with side slopes of 1:6; fabricate converging transitions with side slopes of 1:2. Greater slopes may be used only where space restriction prohibits specified slopes.
   2. Factory fabricated ductwork construction shall conform to applicable requirements stipulated above for shop fabricated ductwork.

B. Galvanized Steel Ductwork (GSD)
   1. Rectangular Cross Section
      a. Shop fabricated of prime grade lock seam for quality galvanized steel sheet in accordance with requirements stipulated above and fitted with auxiliaries and accessories as specified below and shown on the drawings.
   2. Low Pressure Ductwork, up to 2" static pressure and 2,500 fpm:
   3. Rectangular Duct: GSD gauge per SMACNA or C.M.C whichever is more stringent.
   4. Round Duct: As manufactured by United McGill Corp or equal. Uni-Rib, UNIRIB DUCT machine formed, spiral lock seam construction spot welded and bonded seams with an intermediate standing rib for rigidity. Slip joint construction couplings with a minimum of 2" insertion length. GSD gauge per SMACNA or C.M.C whichever is more stringent.

5. Fittings: (except elbows) machine formed using SMACNA RL-1 seams with seal class B.
6. Plenums: Fabricate cross-brake panels and stiffen with galvanized steel angle iron members. Provide duct access doors as specified below and as shown on drawings.
7. Elbows: fittings shall have a wall thickness not less than that specified for longitudinal straight ducts as shown in Table 3-2 and 3-3, SMACNA HVAC Duct Construction Standards, Metal and Flexible, 4" - 8" two piece, die stamped with fully welded longitudinal seam; 9" - 30", segmented standing seam construction; 31" - 36", segmented construction with joint spot welded and bonded. Each segmented elbow shall have the number of segments as indicated by Table 3-1 SMACNA HVAC Duct Construction Standards, Metal and Flexible for above 1500 fpm.

C. Medium Pressure Duct, from above 2" to 6" static pressure and to 4000 fpm:
1. All ductwork shall be constructed per SMACNA guidelines or C.M.C whichever is more stringent for medium pressure ductwork.
2. Flat Oval Duct:
   a. As manufactured by United McGill Corp or equal. Uni-Seal flat oval duct and fittings, spiral lock seam or fully welded longitudinal seam, as needed, construction, and FORC reinforcing connectors.

Major Axis	up to 24"	25"- 36"	37"- 48"	49"- 60"	61" - 70"	71" & Up
GSD Gage:	24	22	22	20	20	18
Fittings Gage:	20	20	18	18	16	16

   b. Fittings: (except elbows) machined formed using SMACNA RL-1 seams with seal class A.
3. All ductwork shall be constructed per SMACNA guidelines or C.M.C whichever is more stringent for medium pressure ductwork.
4. Round Duct:
   a. As manufactured by United McGill Corp or equal. Uni-Seal heavy gauge round duct and fittings machine formed, spiral lock seam or fully welded, as needed, construction for rigidity.
   b. Fittings: (except elbows) machined formed using SMACNA RL-1 seams with seal class A.
5. Unless otherwise specified, standing seam joint shall be used wherever possible on all fittings. All standing seam joints shall be sealed with a UL-Classified zero flame spread and zero smoke developed cement specially formulated for bonding metal-to-metal joints. In lieu of standing seam construction, joints may be solid welded or spot welded and bonded. All welded joints shall be coated with a protective paint, inside and out, to prevent damage to the galvanized surface. Spot-welded fittings shall have all joints sealed with a UL-Classified zero flame spread and zero smoke developed cement specially formulated for bonding metal-to-metal joints.
6. Elbows: fittings shall have a wall thickness not less than that specified for longitudinal straight ducts as shown in Table 3-2 and 3-3, SMACNA HVAC Duct Construction Standards, Metal and Flexible, 4" - 8" two piece, die stamped with fully welded longitudinal seam; 9" - 30", segmented standing seam construction; 31" - 36", segmented construction with joint spot welded and bonded. Each segmented elbow shall have the number of segments as indicated by Table 3-1 SMACNA HVAC Duct Construction Standards, Metal and Flexible for above 1500 fpm.
7. Divided-flow fittings shall be constructed with a radiused entrance to all branch taps and with no excess material projecting from the body into the branch tap entrance.
8. Liner for all fittings shall be as specified above.

D. Conical Fittings:
1. Low pressure:
   a. All conical fittings shall be constructed with a minimum 2” flare around entire perimeter and a minimum 1:2 slope unless noted otherwise.

2. Medium pressure:
   a. All conical fittings shall be constructed with a minimum inlet equal to 1.5 times the outlet (1.5 x D) and a length equal to 0.7 times the outlet (0.7 x D) where D equals the duct diameter.
   b. All conical fittings shall be constructed per SMACNA HVAC Construction Standards Metal And Flexible, figure 2-6

E. 45 degree entry fittings:
1. All 45 degree entry fittings shall be constructed per SMACNA HVAC Construction Standards Metal And Flexible, figure 2-6.

2.02 DUCTWORK ACCESS

A. Duct Access Doors:
1. Access panels - Rectangular ducts
   a. Size to provide easy access, but not less than 18" wide.
   b. Ventfabrics "Ventlok" insulated, hinged and latched type or equal
2. Access panels - Round ducts
   a. Size to provide easy access, but not less than 18" wide.
   b. Ductmate-Metu round insulated access door or equal

2.03 DUCTWORK ADJUNCTS

A. Insulation: As specified in Section 23 07 00, Insulation.

B. Test Fittings: Ventlok #699.

C. Duct Penetrations:
1. Where ducts penetrate fire separations in the building, provide fire dampers or smoke/fire dampers as specified, shown and required by code.
2. Where ducts penetrate roof or exterior walls, provide 24 gauge galvanized sheet metal flashing and counterflashing; solder all joints and make watertight, including under all air handlers, around all duct work penetrations, and exhaust fans.

D. Sealants
1. Design Polymerics DP1020, Ductmate PROseal high velocity duct sealant, Childers CP-146/CP-148, Fosters 32-19/32-17, or equal, UL 723, ASTM E-84
2. Low Shrinkage, flexible, and mildew resistant conforming to NFPA 90A and 90B

E. Tapes and Adhesives:
1. Pressureless Tapes: Hardcast, 4" wide Type DT 5400 mineral impregnated woven fiber tape with manufacturer's FTA-20 activator/adhesive (indoors) and RTA-50 activator/adhesive (outdoors), applied with brush or roller in accordance with manufacturer's directions.

F. Transverse Duct Connections:
1. Traverse Joints: Ductmate or WDCI proprietary duct connection systems will be accepted. Ductwork constructed using these systems will refer to the manufacturers guidelines for sheet gauge, intermediate reinforcement size and spacing, and joint reinforcements. TDC/TDF/T-24 shall be constructed as a SMACNA T-24 flange.
2. The Ductmate companion angle with an integral polymer mastic seal shall be securely fastened to the duct walls using self-drilling screws, rivets or spot welding. Fastener spacing shall be as recommended by the manufacturer for the size or duct and the pressure class. The raw duct ends shall be properly seated in the integral mastic seal. A continuous strip of closed cell gasket tape, size 1/4" x 3/4", shall be installed between the mating flanges of the companion angles at each transverse joint, and the joint shall be made up using 3/8" diameter x 1" long plated bolts and nuts. Drive-on or snap-on cleats shall be used at spacings as recommended by the manufacturer.
3. The Ductmate system shall not be used for applications with duct gauges heavier than 16 gauge or lighter than 26 gauge.

4. Longitudinal Seams: Pittsburgh Lock shall be used on all longitudinal seams. All longitudinal seams will be sealed with a mastic sealant. Snaplock is not acceptable.

PART 3 - EXECUTION

3.01 APPLICATIONS

A. Galvanized Steel Ductwork (GSD): Except where specified or shown otherwise, use (GSD) conforming to requirements (Part 2), or cross section configuration shown, in all locations (indoor/outdoor, above/below grade, concealed/exposed).

B. Flexible Fibrous Glass Duct (FFG): Use (FFG) only where specifically called for on the drawings, as connection between terminal boxes and air outlets.

3.02 DUCTWORK

A. Pressure-Velocity Classification:
   1. All supply ductwork upstream of terminal units (medium pressure):
      a. All ductwork shall be constructed per SMACNA static pressure class of positive +6” and a velocity of 4000 FPM.
      b. Seal all joints and seams on all ducts and plenums per SMACNA seal class A. Pressure sensitive tapes are not allowed.
   2. All supply ductwork downstream of terminal units (low pressure):
      a. All ductwork shall be constructed per SMACNA static pressure class of positive +2” and a velocity of 2500 FPM.
      b. Seal all joints and seams on all ducts and plenums per SMACNA seal class B. Pressure sensitive tapes are not allowed.
   3. All return ductwork (low velocity):
      a. All ductwork shall be constructed per SMACNA static pressure class of negative -2” and a velocity of 2500 FPM.
      b. Seal all joints and seams on all ducts and plenums per SMACNA seal class B. Pressure sensitive tapes are not allowed.
   4. All general exhaust ductwork (low pressure):
      a. All ductwork shall be constructed per SMACNA static pressure class of negative -2” and a velocity of 2500 FPM.
      b. Seal all joints and seams on all ducts and plenums per SMACNA seal class B. Pressure sensitive tapes are not allowed.

B. Broken places in galvanized coating made in forming shall be completely covered with galvanized paint.

C. All ductwork shall comply with the C.M.C and the local jurisdiction’s addendum.

D. Ducts shall be reinforced in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, Latest Edition (low pressure and medium pressure, where shown on drawings). Duct shall be diagonally creased on all four sides. Seams shall be double crimped, bent and elbows shall be made with the throat radius of all bends 12" diameters of the width of the duct wherever possible and in no case shall the throat radius be less than one diameter of the branch duct. Where space does not permit the above radius or where square elbows are indicated on the drawings, they shall be equipped with turning vanes of an approved type for low velocity ducts. Medium velocity ducts shall not use turning vanes and shall not use square elbows unless shown otherwise. Use Ductmate closure systems for all round and rectangular ducts.

E. Transition pieces in the ducts shall have the sides sloped approximately one to five and no abrupt changes or offsets of any kind in the duct system will be permitted. Round to round take-offs shall be made with 45° wye fittings.

F. Ductwork Auxiliaries
   1. Flexible Connectors
      a. Install duct sections being fitted with a flexible connector with a 3" minimum gap between the ends being bridged by the flexible connector. Provide a generous fold in connector to allow for movement; staple and seal closure.
      b. Provide 26-gauge galvanized steel weather shield on top and sides of flexible duct connectors for outdoor installations. Install weather shield at same time as flexible connectors; unprotected flexible connections will be replaced with new connectors at contractor's expense if the weather shields are installed at a subsequent time.

G. Access and Inspection Panels and Doors
   1. Install panels and doors so that frames do not protrude into air stream. Mount frame against outside of lined ducts; provide 13" flanged stub for access panels on other ducts.
   2. Provide inspection panel at each splitter damper.
   3. Provide access panel at each fire damper or smoke/fire damper and elsewhere in the ductwork as required. Label as specified in Part 2 above.
   4. Plenum doors: Refer to Part 2 above.
   5. Wall and ceiling access panels: Furnish as required for access to ducts, damper operators, duct mounted access panels, etc.; coordinate size and location to obtain good access.

H. Duct sizes shown on lined duct shall be clear inside insulation.

I. Paint the inside of ductwork visible through grilles and registers dull black.

J. Furnish and install 1-1/2 x 1-1/2 x 3/16" closure angles around all exposed ducts through walls and ceilings. (Both sides)

K. Furnish and install 2 x 2 x 3/16" closure angle dams around all ducts through floors. Weld corners, seal with silicone non-hardening sealant and anchor to floor.

L. Access doors shall be provided in ductwork for easy access to each fire damper and smoke/fire damper.

3.03 FIELD QUALITY CONTROL

A. General
   1. Perform testing and provide demonstrations as specified in other HVAC Sections.
   2. Comply with requirements of Part 3, 23 05 00.

B. Duct Cleaning
   1. Clean all ductwork in the shop prior to shipping. All ductwork shall be transported to the site in covered vans to eliminate contamination or shall be sealed prior to shipment and shall be protected from contamination at the site.
   2. After fabrication, and during and after installation, seal sections of open ductwork with plastic sheeting to prevent the intrusion of dirt and debris.
   3. After installation is complete, but before balancing and final connections are made, and with construction filters in place, blow clean all ductwork with the system fans operating at full air volume.
   4. All return air ductwork shall be kept sealed until all construction is complete. If the air conditioning system is used during construction, the return air ductwork system shall not be used. Other means of outlets shall be used, such as leaving doors or windows open.

C. Ductwork Testing:
   1. All medium pressure ductwork (upstream of terminal units) is required to be field tested by the installing contractor for leakage per SMACNA's "HVAC Air Duct Leakage Test Manual".
   2. Partial disassembly and sealing of the system may be necessary for compliance with test requirements.
   3. Allowable leakage shall be no greater than 1% of the design operating air volume for the entire system.

4. Equipment for conducting leakage tests shall be a leakage test kit as manufactured by United McGill Corporation or an approved equal.
5. Leakage for non duct components (fire dampers, smoke dampers, control dampers, etc.) is an integral part of overall system leakage, and these components shall be included in the duct leakage tests.
6. Contractor shall provide the architect with a report on the leakage test(s) and a copy of certified calibration data for leakage test apparatus.

D. Demonstrations: Before enclosing ductwork operate each fire damper and smoke/fire damper in the presence of the Owners representative to show that each damper is functional.

E. Inspections: Evidence of poor fabrication or installation, as disclosed by job site inspections, will be cause for rejection; replacement or repair of defective work shall be done at no additional cost to the Owner.

3.04 ADJUSTING AND FINISHING

A. General: Comply with requirements of Part 3, 23 05 00. Adjust fan speeds as necessary.

END OF SECTION

SECTION 23 31 16
NONMETAL DUCTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The requirements of the GENERAL SUPPLEMENTARY CONDITIONS, and DIVISION 1, GENERAL REQUIREMENTS, apply the work in this section.

1.02 SECTION INCLUDES

A. General: Refer to Section 23 05 00.

B. Work Included: Provide all ductwork and ductwork accessories, auxiliaries and adjuncts for all systems as specified or shown.

C. Work Described Elsewhere: HVAC piping, equipment, and controls are specified in other HVAC Sections.

PART 2 - PRODUCTS

2.01 DUCT WORK

A. Factory-made Air Ducts (flexible ducts):

B. Factory-made air ducts shall be approved for the use intended or shall conform to the requirements of C.M.C. Standard No. 6-1.
   1. Each portion of a factory-made air duct system shall be identified by the manufacturer with a label or other suitable identification indicating compliance with C.M.C. Standard No. 6-1 and its class designation. These ducts shall be listed and shall be installed in accordance with the terms of their listing.
   2. All factory-made air ducts must be Approved Class 0 or Class 1.

C. Flexible Ducts: Comply with SMACNA's "Duct Construction Standards, Metal and Flexible. Owens-Corning Fiberglass Valuflex or equal, insulated, wire helix type, 6 inch W.C. min. Product shall qualify as Class I Air Duct per UL181. Inner liner shall be black where visible through registers. All flexible ductwork must have a FHC not exceeding 25/50.

D. Flexible Ductwork - Circular Cross Section:
   1. Thermaflex, Anaco Flex Systems, Cal-Flex Model #2PPJ or equal insulated flexible glass fiber duct factory fabricated as a Class 1 air duct, constructed of 2-layers of polyester film 100% bonded together, encapsulating the galvanized steel wire. Insulated with fiberglass insulation and jacketed with a reinforced vapor barrier jacket listed and labeled as a Class 1 Air Duct. Tested in accordance with U.L. Standard 181. Meets all requirements of NFP 90-A & 90-B, UMC Standard 6.1, Appendix A. Inner liner shall be black where visible through registers. All flexible ductwork must have a FHC not exceeding 25/50
   2. R-Value shall be 8.0 or greater in accordance with ADC Flexible Duct Performance and Installation Standards.
   3. Joint sealant: Fiberglass Type II (glass fabric) Duct Tape with a UL 181 B-M rating and panduit strap, as detailed on drawings.

PART 3 - EXECUTION

3.01 APPLICATIONS

A. Flexible Fibrous Glass Duct (FFG): Use (FFG) only where specifically called for on the drawings, as connection between terminal boxes and air outlets.

B. All ductwork shall comply with the C.M.C and the local jurisdiction’s addendum.

C. Flexible Fibrous Glass Ducts (FFG) - install as follows:
   1. In a single piece not exceeding 5 feet in length downstream of terminal boxes (low pressure) and in a single piece not exceeding 3 feet in length upstream of terminal boxes (medium pressure).
   2. With each section carrying a UL Class I label.
   3. With no sharp bends. Do not bend size 4" through 12" diameter in excess of 180° in a 6 ft. length; do not bend sizes over 12" diameter in excess of 90° in a 6 ft. length.
   4. Listed flexible duct: Install flexible duct as per manufacturers instructions. With all metal-to-metal connections secured with Panduit PLT-8H clamps or stainless steel cinch clamp, apply duct sealant between the end of the duct and the collar in a 2-inch band and clamp as described above. Allow at least 48 hours before pressure testing.
   5. Supported at 4 ft. centers with 24 gauge, 12" galvanized saddles.

D. Flexible Fibrous Glass Ducts (FFG) – shall not be used to replace rigid elbows or fittings per the CMC.

3.02 FIELD QUALITY CONTROL

A. General
   1. Perform testing and provide demonstrations as specified in other HVAC Sections.
   2. Comply with requirements of Part 3, Section 23 05 00.

B. Duct Penetrations:
   1. Where ducts penetrate fire separations in the building, provide fire dampers or smoke/fire dampers as specified, shown and required by code.

C. Demonstrations: Before enclosing ductwork operate each fire damper and smoke/fire damper in the presence of the Owners representative to show that each damper is functional.

D. Inspections: Evidence of poor fabrication or installation, as disclosed by job site inspections, will be cause for rejection; replacement or repair of defective work shall be done at no additional cost to the Owner.

END OF SECTION

SECTION 23 33 13
DAMPERS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The requirements of the GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS, and DIVISION 1, GENERAL REQUIREMENTS, apply to the work in this section.

B. Section 23 05 00, General Mechanical Requirements applies to this section.

1.02 QUALITY ASSURANCE

A. All HVAC equipment shall comply with California Code of Regulations, Title-24, Part 6, latest edition.

B. Comply with UL 1/81 and UL 181A for ducts and closures.

PART 2 - PRODUCTS

2.01 DAMPERS

A. All dampers for us in low temperature air below 50° F duct shall have non-conducting composite damper shafts with shaft bearings and air seats.

B. Manual Dampers:
   1. Round Ductwork 16” and smaller (low pressure):
      a. Butterfly type, volume dampers.
      b. Provide locking mechanism shall be provided on either the quadrants or end bearings. Ventlock or equal. Damper blade shall be a minimum of 22 gauge, but not less than two gauges more than the duct gauge.
      c. All duct penetrations shall be gasketed to prevent air leakage.
      d. Provide stand-offs as required for specified insulation thickness (see section 23 07 13.
      e. Continuous 3/8” min rod shall be provided.
      f. In locations where ducts are exposed use Ventlok #688 damper regulator for low pressure applications.
   2. Round Ductwork 18” and larger (low pressure):
      a. Manual Dampers: Opposed blade type, 6” maximum blade width, Vent Products model 5303 or equal.
   3. Rectangular Ductwork 12” high and smaller (low pressure):
      a. Rectangular volume dampers shall be Air Balance #111 or equal.
   4. Rectangular Ductwork larger than 12” high (low pressure):
      a. Rectangular volume dampers shall be Air Balance #AC-2 or equal.

C. Control Dampers:
   1. Ruskin CD-50, or equal, and shall be low leakage damper, with published leakage data certified under the AMCA certified ratings program showing leakage through a 48” x 48” damper at 4 in. w.g. pressure difference to be less than 6.2 cfm per sq. ft. Same published leakage data shall also include leakage information for all available damper sizes at pressure differences from 1 in. w.g. through 12 in. w.g.
   2. Low leakage dampers shall meet the following minimum construction standards: Frames shall be 5” x 1” x .125” minimum 6063T5 extruded aluminum hat channel with hat mounting flanges on both sides of the frame.
   3. Each corner shall be reinforced with two die formed internal braces and machine staked for maximum rigidity.
   4. Blades shall be airfoil type extruded aluminum (maximum 6” depth) with integral structural reinforcing tube running full length of each blade.

5. Blade edge seals shall be extruded vinyl double edge design with inflatable pocket which enables air pressure from either direction to assist in blade-to-blade seal off. Blade seals shall be locked in extruded blade slots without use of cement, yet shall be easily replaceable in field.
6. Bearings shall be non-corrosive two piece molded synthetic. Axles shall be square or hexagonal, round are not acceptable, to provide positive locking connection to blades and linkage.
7. Linkage shall be concealed in frame.
8. Damper manufacturer's literature shall include performance data developed from testing in accordance with AMCA Standard 500 in an AMCA APPROVED LABORATORY showing pressure drop for all sizes of dampers required at all anticipated air flow rates.
9. Controls/Actuators will be furnished and mounted

D. Smoke/Fire Dampers:
1. General:
   a. Provide Greenheck Model FSD-211 or FSDR-511 or equal with State Fire Marshal approval for all applications other than in Stainless Steel Ductwork.
   b. Provide Ruskin Model FSD36 or equal with State Fire Marshal approval for all applications in Stainless Steel Ductwork.
   c. The maximum pressure drop at design flow of the smoke fire damper shall not exceed 0.3 inches w.g.
   d. Provide a duct mounted smoke detector with in-duct probes. No duct smoke detectors shall be located inside the duct.
   e. Provide a fire alarm connection to monitor the damper. Coordinate with the fire alarm design.
   f. Provide electrical power to the damper per the plans.
2. The combination fire smoke dampers shall meet or exceed the following specifications:
   a. The frame shall be a minimum of 16 gauge (1.52) galvanized steel formed into a structural hat channel shape with tabbed corners for reinforcement.
   b. Bearings shall be stainless steel sleeve turning in an extruded hole in the frame.
   c. The blades shall be airfoil shaped double skin construction with 14 (1.90) gauge equivalent thickness.
   d. Blade edge seals shall be silicone rubber and galvanized steel mechanically locked in blade edge, adhesive or clip fastened seals are not acceptable, and shall withstand 450° F.
   e. Jamb seals shall be stainless steel flexible metal compression type. Blade action must be opposed.
3. Each combination fire smoke damper shall be 12-hour fire rated under UL Standard 555, and shall further be classified by Underwriters Laboratories as a Leakage Rated Damper for use in smoke control systems under the latest version of UL555S, and bear a UL label attesting to same.
4. Damper manufacturer shall have tested and qualified with UL, a complete range of damper sizes covering all dampers required by this specification. Testing and UL qualifying a single damper size is not acceptable.
5. The leakage rating under UL555S shall be no higher than leakage class 1 (4 cfm/ft. at 1" w.g. and 8 cfm/ft. at 4" w.g.)
6. As part of the UL qualification, dampers shall have demonstrated a capacity to operate (to open and close) under HVAC system operating conditions, with pressures of at least 4" w.g. in the closed position and 3000 fpm air velocity in the open position.
7. In addition to the leakage ratings already specified herein, the combination fire smoke dampers and their actuators shall be qualified under UL555S to an elevated temperature of 350°F.
8. Appropriate electric actuators shall be installed by the damper manufacturer at time of damper fabrication. Damper and actuator shall be supplied as a single entity which meets all applicable UL555 and UL555S qualifications for both dampers and actuators.

9. Manufacturer shall provide factory assembled sleeve of 16” minimum length, contractor to verify requirement.
10. Factory supplied caulked sleeve shall be 20 gauge to dampers through 84” wide and 18 gauge above 84” wide.
11. Damper and actuator assembly shall be factory cycled 10 times to assure operation.
    a. Coordinate damper actuator voltages with Fire Alarm Contractor.
12. Each combination fire/smoke damper shall be equipped with a controlled 7 to 15 second heat actuated release devise.
13. The electric EFL (electric fuse link) shall close and lock the fire/smoke damper during test, smoke detection, power failure or fire conditions through the actuator closure springs.
14. To prevent duct and HVAC component damage, the damper shall at all times be connected to the actuator for controlled closure in not less than 7 seconds and no more than 15 seconds. Instantaneous damper closure is unacceptable.
15. Damper shall be automatic remote resettable after test, smoke detection or power failure conditions. After exposure to high temperature or fire, the damper must be inspected prior to reset to ensure proper operation. Release temperature shall be 165°F, 212°, 285°F.
16. Actuator: Provide Belimo FN120 or NF24 spring return damper actuator. Coordinate with fire alarm design for correct voltage. Actuator shall be located outside the airstream and duct.

PART 3 - EXECUTION

3.01 DAMPERS

A. Install duct accessories according to applicable portions of details of construction as shown in SMACNA standards.

B. Install volume-control dampers in lined duct with methods to avoid damage to liner and to avoid erosion of duct liner.

C. Ductwork shall comply with Chapter 6 C.M.C.

D. Where ducts penetrate fire separations in the building, provide fire dampers or smoke/fire dampers as specified, shown and required by code.

E. Balancing Dampers
   1. Provide balancing dampers (same as volume dampers specified in this section) where shown on drawings and any other locations required to achieve proper system air balance. In general, balancing dampers are required at all zone supply air ducts from supply air plenums, equipment, and in ducts to supply and return air grilles. All dampers shall be placed as shown. Minimum of seven duct diameters prior to the diffuser or register.
   2. Damper operators shall be installed in either to side or bottom of ductwork.

END OF SECTION

This page intentionally left blank

SECTION 23 33 23
TURNING VANES

PART 1 - GENERAL

1.01 – SEE 23 05 00 PART 1

PART 2 - PRODUCTS

2.01 AIR TURNING VANES AND DEVICES

A. Ordinary type installed in elbows: Type, size, etc., as shown on drawings (see Duct Symbol Legend), fiberglass turning vanes are not acceptable. Install multiple turning vane sections with vanes 36” long or less in large elbows. Use turning vanes specifically rated for medium velocity when duct velocity exceeds 2,500 fpm.
   1. Installed at duct branches or take-offs where shown: Ward Industries VNN, VNA, Airsan Accoustiturn, or equal.
   2. Installed downstream of VAV boxes in supply ductwork and in all return ductwork.

PART 3 - EXECUTION

3.01 AIR TURNING VANES AND DEVICES

A. Provide at all square elbows and elsewhere as shown and scheduled on drawings. Do not use double thickness duct turns on turns less than 12" wide. Where height of double thickness duct turns exceeds 36", provide 1" H 1" H 16 gauge channel brace at mid-height, secure to duct at both ends. Acoustical duct turns: Where height exceeds 36" provide 16 gauge channel brace at mid-height secured to duct at both ends. Fiberglass turning vanes will not be acceptable.

END OF SECTION

This page intentionally left blank

SECTION 23 33 43
FLEXIBLE CONNECTORS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The requirements of the GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS, and DIVISION 1, GENERAL REQUIREMENTS, apply to the work in this section.

B. Section 23 05 00, General Mechanical Requirements applies to this section

1.02 QUALITY ASSURANCE

A. All HVAC equipment shall comply with California Code of Regulations, Title 24, Part 6, latest edition.

B. Comply with UL 181 and UL 181A for ducts and closures.

PART 2 - PRODUCTS

2.01 EQUIPMENT

A. Flexible Connectors: Ventlok, flexible fabric, Duralon Flexible fabric with Metalfab connectors at connections to fans and air handling equipment.
   1. Comply with UL 181, Class 1.
   2. Minimum fabric weight 26 oz. / sq. yd. ± 2 oz., thickness 0.019".
   3. Ventfabrics Inc. Ventlon, or equal, for exterior applications, resistant to sunlight, ozone and weather.
   4. Ventfabrics Inc. Ventglass, or equal, for interior applications.
   5. Complies with Underwriters Laboratories Standard # 214 for fire retardancy, and is accepted by the National Fire Protection Association for vibration isolation connectors in duct systems as covered by Paragraph 2-1.2.3 NFPA Bulletin #90A.
   6. Bonding Agent, Ventfabrics # 655 Adhesive or equal.

PART 3 - EXECUTION

3.01 DUCTWORK AUXILIARIES

A. Flexible Connectors
   1. Install duct sections being fitted with a flexible connector with a 3" minimum gap between the ends being bridged by the flexible connector. Provide a generous fold in connector to allow for movement; staple and seal closure.
   2. Provide 26-gauge galvanized steel weather shield on top and sides of flexible duct connectors for outdoor installations. Install weather shield at same time as flexible connectors; unprotected flexible connections will be replaced with new connectors at contractor's expense if the weather shields are installed at a subsequent time.
   3. Ductwork shall be supported separately from the fan within 3 feet of the flexible connection.

END OF SECTION

This page intentionally left blank

SECTION 23 33 53
DUCT LINER

PART 1 - GENERAL

1.01 – SEE 23 05 00

PART 2 - PRODUCTS

2.01 EQUIPMENT

A. Miscellaneous equipment not specified herein shall be furnished as scheduled on the drawings.

B. C.C.R. - Title 24 Energy Standards, Requirements: All insulation values shall meet current requirements of the C.C.R. Energy Standards.

2.02 DUCT WORK

A. Rectangular Duct, Flexible Blanket Liner: Flexible blanket made from strong, glass fibers bonded with a dark impregnated thermosetting resin as manufactured by Johns Manville or equal.
   1. Air stream surface shall be protected with a smooth surface coating for minimum resistance to airflow, Permacote or equal, UL 723 compliant.
   2. Flame spread not over 25, Smoke Developed not over 50.
   3. The duct liner shall be suitable for direct application and service as a thermal/acoustical liner for hot or cold round ductwork at air velocities up to 6,000 fpm.
      a. 1” thickness
         1) Liner shall have a minimum R-value of 4.2 and Conductance of 0.24 at 75oF in accordance with ASTM C518
         2) Noise: Liner shall have a minimum NRC of 0.70 when tested in accordance with ASTM C423-90 and ASTM E795
      b. 1 ½" thickness
         1) Liner shall have a minimum R-value of 6.3 and Conductance of 0.16 at 75o F in accordance with ASTM C518
         2) Noise: Liner shall have a minimum NRC of 0.85 when tested in accordance with ASTM C423-90 and ASTM E795
      c. 2” thickness
         1) Liner shall have a minimum R-value of 8.0 and Conductance of 0.13 at 75o F in accordance with ASTM C518
         2) Noise: Liner shall have a minimum NRC of .95 when tested in accordance with ASTM C423-90 and ASTM E795
      d. The duct liner shall be suitable for direct application and service as a thermal/acoustical liner for hot or cold rectangular ductwork and plenums at air velocities up to 6,000 fpm.

B. Round Duct, Spiracoustic Plus, Coated Liner as manufactured by Johns Manville or equal.
   1. Air stream surface shall be protected with a smooth surface coating for minimum resistance to airflow, Permacote or equal, UL 723 compliant.
   2. Flame spread not over 25, Smoke Developed not over 50.
   3. The duct liner shall be suitable for direct application and service as a thermal/acoustical liner for hot or cold round ductwork at air velocities up to 6,000 fpm.
   4. 1" Thickness
      a. Liner shall have a minimum R-value of 4.3 and Conductance of 0.23 at 75degree F in accordance with ASTM C518.
      b. Noise: Liner shall have a minimum NRC of 0.75 when tested in accordance with ASTM C 423.or equal

1) Duct diameters from 8" – 16", Spiracoustic Plus VSD Round Liner Board, or equal.
2) Duct diameters from 18" – 30", Spiracoustic Plus SD Round Liner Board, or equal.
3) Duct diameter 32” and larger, Spiracoustic Plus LD Round Liner Board, or equal.

5. 1 ½" thickness
   a. Liner shall have a minimum R-value of 6.4 and Conductance of 0.16 at 75o F in accordance with ASTM C518.
   b. Noise: Liner shall have a minimum NRC of 0.85 when tested in accordance with ASTM C 423.
      1) Duct diameters from 14" – 21", Spiracoustic Plus VSD, Round Liner Board, or equal:
      2) Duct diameters from 22" – 38", Spiracoustic Plus SD Round Liner Board:
      3) Duct diameters from 39" or greater diameter, Spiracoustic Plus LD Round Liner Board:
6. 2" Thickness
   a. Liner shall have a minimum R-value of 8.4 and Conductance of 0.12 at 75o F in accordance with ASTM C518.
   b. Noise: Liner shall have a minimum NRC of .95 when tested in accordance with ASTM C 423.
      1) Duct diameters from 18" – 24", Spiracoustic Plus VSD, Round Liner Board, or equal:
      2) Duct diameters from 26" – 53", Spiracoustic Plus SD Round Liner Board:
      3) Duct diameters from 54" or greater diameter, Spiracoustic Plus LD Round Liner Board:

PART 3 - EXECUTION

3.01 DUCT LINER

A. Install volume-control dampers in lined duct with methods to avoid damage to liner and to avoid erosion of duct liner.

B. Duct Liner
   1. Applications
      a. Rectangular Supply Ducts Exposed to Weather: Flexible Blanket/Coated Liner, 2” thickness.
      b. Rectangular Ductwork Exposed in Space or Concealed Above Ceiling: Flexible Blanket/Coated Liner, 1" thickness.
      c. Round Ductwork Exposed in Space or Concealed Above Ceiling: Flexible Blanket/Coated Liner, 1" thickness.
      d. Round Ductwork Exposed to the Weather: Flexible Blanket/Coated Liner, 2" thickness.
   2. Install duct liner in all plenums, exposed ducts and ducts for a distance of 10' on each side of all fans, where specified here and at other locations indicated on drawings.
   3. On rectangular duct secure duct and plenum liner with cement stic-klips at 12" o.c. both ways to duct with Mircale adhesive, then cement the lining in place with 50% covering of Fosters #81-99 Safetee Duct-Fas adhesive. Apply a brush coat of adhesive to edges of insulation where abutted together inside ductwork. Do not leave any raw edges of liner uncoated.
   4. On round spiral duct install in accordance with the current Johns Manville Spiracoustic Round Liner System Installation Guide. Apply a brush coat of adhesive to edges of insulation where abutted together inside ductwork. Do not leave any raw edges of liner uncoated.
   5. Duct sizes shown on lined duct shall be clear inside insulation.

END OF SECTION

SECTION 23 62 13
AIR COOLED REFRIGERANT CONDENSING UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Condensing unit package.

B. Charge of refrigerant and oil.

C. Controls and control connections.

D. Refrigerant piping connections.

E. Motor starters.

F. Electrical power connections.

1.02 REFERENCES

A. ANSI/ASHRAE 15 - Safety Code for Mechanical Refrigeration.

B. ANSI/ASHRAE 90A - Energy Conservation in new Building Design.

C. AHRI 370 - Sound Rating of Large Refrigeration and Air-conditioning Equipment.

D. AHRI 365- Unitary Air-Conditioning Equipment.

1.03 SUBMITTALS

A. Submit shop drawings indicating components, dimensions, weights and loadings, required clearances, and location and size of field connections. Include schematic layouts showing condensing units, cooling coils, refrigerant piping, and accessories required for complete system.

B. Submit product data indicating rated capacities, weights, specialties and accessories, electrical nameplate data, and wiring diagrams.

C. Submit design data indicating refrigeration and chilled water pipe sizing.

D. Submit manufacturer's installation instructions.

1.04 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data.

B. Include manufacturer's descriptive literature, start-up instructions, installation instructions, and maintenance procedures.

1.05 HANDLING

A. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.

B. Protect units on site from physical damage.

1.06 WARRANTY

A. Manufacturer shall provide a parts and labor warranty for one year from start-up or 18 months from shipment, whichever occurs first.

B. Provide manufacturer's 2nd-5th year extended compressor parts only warranty.

1.07 ACOUSTICS

A. Manufacturer of condensing unit shall provide outdoor sound power level at gross cooling capacity, and at significant part-load stages (for units equipped to be operated in stages). Outdoor sound shall consist of radiated sound power for each octave band from 63Hz to 8kHz. Data shall be obtained in accordance with ANSI/AHRI Standard 370.

1.08 REGULATORY REQUIREMENTS

A. Unit shall conform to latest UL, CAN/CSA C22.2 NO. 236-95 for construction of condensing units and shall have cULus label affixed to unit.
   1. In the event the unit is not UL/CSA approved, the manufacturer shall, at his expense, provide for a field inspection by a UL representative to verify conformance to cULus standards. If necessary, contractor shall perform required modifications to the unit to comply with UL, as directed by the UL representative, at no additional expense to the Owner.

1.09 SUMMARY

A. The contractor shall furnish and install air-cooled condensing unit(s) as shown as scheduled on the contract documents. The unit(s) shall be installed in accordance with this specification and perform at the specified conditions as scheduled.

PART 2 PRODUCTS

2.01 GENERAL UNIT DESCRIPTION

A. Provide self-contained, packaged, factory-assembled and pre-wired units suitable for outdoor use consisting of cabinet, compressors, condensing coil and fans, subcooling circuits, and controls.

B. Manufacturer:
   1. Trane model RAUJ or Equal.

2.02 CASING

A. Units shall be constructed of 14-gauge welded galvanized steel frame with 14 and 16-gauge galvanized steel panels and access doors. Units shall have factory mounted, louvered, full-length steel grilles to protect the condenser coils and piping. Unit surface shall be phosphatized and finished with an air-dry paint. This air-dry paint finish shall be durable enough to withstand a minimum of 672-consecutive-hour salt spray application in accordance with standard ASTM B117.

2.03 CONDENSER SECTION

A. Condenser coils shall have all Aluminum Microchannel coils. All coils shall be leak tested at the factory to ensure pressure integrity. The condenser coil shall be pressure tested to 650 psig.

B. Provide factory mounted, louvered, full- length steel grilles to protect the condenser coils and piping.

2.04 REFRIGERANT CIRCUIT(S)

A. Provide two refrigerant circuits.

B. TXV and refrigerant specialties to be supplied by manufacturer. Installation shall require use of 30% or 15% bleed thermal expansion valves. Quantity and size shall be based on the application and determined by the installer.

Note: Liquid line solenoids are required for all applications. Trim solenoids cannot be used.

C. Provide Suction Service Value. Unit shall include a refrigerant shut off valve to isolate the compressor for servicing.

D. Provide Pressure gauges. Gauges shall be provided for monitoring suction and discharge pressure. One set shall be provided for each circuit.

2.05 FANS AND MOTORS

A. Condenser Fans shall have Vertical discharge, direct drive fans with aluminum blades and zinc plated steel hubs guard on discharge. Fans shall be statically and dynamically balanced.

B. Condenser fan motors shall totally enclosed three-phase motors with permanently lubricated ball bearings, built in current and thermal overload protection and weather-tight slingers over motor bearings.

2.06 COMPRESSORS

A. Scroll compressors shall provide low vibration. Compressors shall have a completely enclosed compression chamber with no leakage paths. The compressor(s) shall be suction gas cooled, direct drive, with 3600 RPM hermetic motors. The scroll compressor shall include a centrifugal oil pump, oil level sight glass, and an oil charging valve.

B. Motor shall be designed for across-the-line starting and suitable for a voltage utilization range of +/- 10 percent from nameplate voltage.

2.07 SYSTEM CONTROLS

A. No System Control: Provide compressors wired to a terminal strip inside the control panel. Include guaranteed fixed-on and -off timers for compressor protection. Temperature controls not included in unit.

B. Unit operating range shall be 40F to 125F.

2.08 MISCELLANEOUS FEATURES

A. Provide a non-fused disconnect switch. Disconnect shall be mounted in the control box and

provides for interruption of power for servicing the unit. Lugs shall be suitable for copper wires only. No overcurrent or short circuit protection is provided for unit by this switch.

B. Provide powered convenience outlet. 115v/15amp ground fault interrupter convenience outlet shall be factory installed with a single point power entry from a factory mounted transformer. It shall meets NEC 210-63 requirements. This outlet shall include a separate disconnect switch so that the outlet is powered when the unit disconnect switch is off.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide for connection to electrical service.

C. Install units on vibration isolation.

D. Provide connection to refrigeration piping system and evaporators.

3.02 MANUFACTURER'S FIELD SERVICES

A. Manufacturer shall supply initial charge of refrigerant and oil for each refrigerant circuit. Trim charge to accommodate refrigerant piping and evaporator coil shall be supplied and charged by installing contractor.

B. OEM Startup is required and shall be performed by factory service technicians confirming equipment has been correctly installed and passed specification checklist prior to equipment becoming operational.

END OF SECTION

SECTION 23 73 43.16
OUTDOOR, SEMI-CUSTOM AIR HANDLING UNITS (CAH & HAU)

PART 1 GENERAL

1.01 WORK INCLUDED

A. Applied Air Handling Units.

1.02 REFERENCES

A. AMCA Publication 99 - Standards Handbook.

B. AMCA Publication 611 - Certified Ratings Program - Airflow Measurement Performance

C. AMCA Standard 500-D - Laboratory Methods of Testing Dampers for Rating.

D. ANSI/ABMA Standard 9 - Load Ratings and Fatigue Life for Ball Bearings.

E. ANSI/AMCA Standard 204 - Balance Quality and Vibration Levels for Fans.

F. ANSI/AMCA Standard 610 - Laboratory Methods of Testing Airflow Measuring Stations for Rating.

G. ANSI/AHRI Standard 410 - Forced Circulation Air-Cooling and Air-Heating Coils.

H. ANSI/AHRI Standard 430 - Central Station Air Handling Units.

I. ANSI/AHRI Standard 1060 - Rating Air-To-Air Energy Recovery Ventilation Equipment

J. ANSI/ASHRAE Standard 52.2 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size.

K. ANSI/ASHARE Standard 62.1 - Ventilation for Acceptable Indoor Air Quality.

L. ANSI/ASHARE Standard 90.1 - Energy Standard for Buildings Except Low-Rise Residential Buildings.

M. ANSI/NEMA MG 1 - Motors and Generators.

N. ANSI/UL 900 - Standard for Safety Air Filter Units.

O. AHRI Standard 260 - Sound rating of Ducted Air Moving and Conditioning Equipment.

P. ASHRAE Standard 84 - Method of Testing Air-to-Air Heat Exchangers.

Q. ASHRAE Standard 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems.

R. ASTM B117 - Standard Practice for Operation Salt Spray Apparatus.

S. ASTM C1071 - Thermal and Acoustic Insulation (Mineral Fiber, Duct Lining Material).

T. ASTM C1338 - Standard Test Method for Determining Fungi Resistance of Insulation Material and Facings.

U. ASTM E477 - Standard Test Method for Measure Acoustical and Airflow Performance of Duct Liner

V. NFPA 70 - National Electrical Code

W. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilation Systems.

X. UL Latest Edition - Standard for Safety Heating and Cooling Equipment

1.03 QUALITY ASSURANCE

A. Air Coils: Certify capacities, pressure drops and selection procedures in accordance with current AHRI Standard 410.

B. Air handling units with fan sections utilizing single fans shall be rated and certified in accordance with AHRI Standard.

C. Air handling units with fan sections utilizing multiple fans shall be rated in accordance with AHRI Standard 430 for airflow, static pressure, and fan speed performance.

D. Airflow monitoring station: Certify airflow measurement station performance in accordance with AMCA 611.

E. ISO 9001 Certification.

1.04 SUBMITTALS

A. No equipment shall be fabricated or delivered until the receipt of approved shop drawings from the Owner or Owner's approved representative.

B. AHU manufacturer shall provide the following information with each shop drawing/product data submission:
   1. Dimensioned arrangement drawings for each AHU including a plan and elevation view of the assembled unit with overall dimensions, lift points, unit shipping split locations and dimensions, installation and operating weights, and installation, operation and service clearances.
   2. All electrical, piping, and ductwork requirements, including sizes, connection locations, and connection method recommendations.
   3. Each component of the unit shall be identified and mechanical specifications shall be provided for unit and accessories describing construction, components, and options.
   4. All performance data, including capacities and airside and waterside pressure drops, for components.
   5. Fan curves shall be provided for fans with the design operating points indicated. Data shall be corrected to actual operating conditions, temperatures, and altitudes.
   6. For units utilizing multiple fans in a fan section, a fan curve shall be provided showing the performance of the entire bank of fans at design conditions. In addition, a fan curve shall be provided showing the performance of each individual fan in the bank of fans at design conditions. Provide a fan curve showing the performance of the bank of fans, if one fan is down. The percent redundancy of the bank of fans with one fan down shall be noted on the fan curve or in the tabulated fan data.
   7. A filter schedule must be provided for each air handling unit supplied by the air handling unit manufacturer. Schedule shall detail unit tag, unit size, corresponding filter section

location within the AHU, filter arrangement (e.g. angled/flat), filter depth, filter type (e.g. pleated media), MERV rating, and filter quantity and size.

8. A schedule detailing necessary trap height shall be provided for each air handling unit. Schedule shall detail unit tag, unit size, appropriate trap schematic with recommended trap dimensions, and unit supplied base rail height. Contractor shall be responsible for additional trap height required for trapping and insulation beyond the unit supplied base rail height by adequate housekeeping pad.
9. An electrical MCA - MOP schedule shall be provided for each electrical circuit to which field-power must be supplied. Schedule to detail unit tag, circuit description, voltage/phase/hertz, Minimum Circuit Ampacity (MCA), and calculated Maximum Overcurrent Protection (MOP).
10. Sound data shall be provided using AHRI 260 test methods. Unit discharge, inlet, and radiated sound power levels in dB shall be provided for 63, 125, 250, 500, 1000, 2000, 4000 and 8000Hz.

C. The AHU manufacturer shall provide appropriate sets of submittals as referenced in the General Conditions and shall submit to the Owner electronic copies of the IOM.

D. The AHU manufacturer shall list any exceptions to the specification.

1.05 REGULATOR REQUIREMENTS

A. Agency Listings/Certifications
1. Unit shall be manufactured to conform to UL 1995 and shall be listed by either UL/CUL or ETL. Units shall be provided with listing agency label affixed to the unit. In the event the unit is not UL/CUL or ETL approved, the contractor shall, at his/her expense, provide for a field inspection by a UL/CUL or ETL representative to verify conformance. If necessary, contractor shall perform modifications to the unit to comply with UL/CUL or ETL as directed by the representative, at no additional expense to the owner.
2. Air handling units with multiple direct drive plenum fans, or direct drive plenum fans incorporated with ECM style motors are outside the scope of AHRI 430. These fans however are rated in accordance with AHRI 430.
3. Certify air handling units in accordance with AHRI Standard 430. Units shall be provided with certification label affixed to the unit. If air handling units are not certified or fans are not rated in accordance with AHRI Standard 430 contractor shall be responsible for expenses associated with testing of units after installation to verify performance of fan(s). Any costs incurred to adjust fans to meet scheduled capacities shall be the sole responsibility of the contractor.
4. Certify air handling coils in accordance with AHRI Standard 410. Units shall be provided with certification label affixed to the unit. If air handling coils are not certified in accordance with AHRI Standard 410, contractor shall be responsible for expenses associated with testing of coils after installation to verify performance of coil(s). Any costs incurred to adjust coils to meet scheduled capacities shall be the sole responsibility of the contractor.
5. Certify airflow monitoring stations are tested for differential pressure in accordance with AMCA 611 in an AMCA registered laboratory and comply with the requirements of the AMCA Certified Ratings Program. Airflow monitoring station shall be licensed to bear the AMCA Seal.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.

B. Units shall ship fully assembled up to practical shipping and rigging limitations. Units not shipped fully assembled shall have tags and airflow arrows on each section to indicate

location and orientation in direction of airflow. Shipping splits shall be clearly defined on submittal drawings. Cost associated with non-conformance to shop drawings shall be the responsibility of the manufacturer. Each section shall have lifting lugs for field rigging, lifting and final placement of AHU section(s). AHU's less than 100-inches wide shall allow for forklift transport and maneuverability on the jobsite.

C. Deliver units to jobsite with fan motor(s), sheave(s), and belt(s) completely assembled and mounted in units.

D. Unit shall be shipped in a clear shrink-wrap or stretch-wrap to protect unit from in-transit rain and debris per ASHRAE 62.1 recommendations.

E. Installing contractor shall be responsible for storing AHU in a clean, dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

1.07 START-UP AND OPERATING REQUIREMENTS

A. Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters in place, bearings lubricated (if applicable), condensate properly trapped, piping connections verified and leak-tested, belts aligned and tensioned, all shipping braces removed, bearing set screws torqued, and fan has been test run under observation.

1.08 WARRANTY

A. AHU manufacturer shall provide a parts and labor warranty that covers a period of one year from unit start-up or 18 months from shipment, whichever occurs first. This warrants that all products are free from defects in material and workmanship and shall meet the capacities and ratings set forth in the equipment manufacturer's catalog and bulletins.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Trane model CSAA or Equal.

2.02 GENERAL

A. Unit layout and configuration shall be as defined in project plans and schedule.

B. Manufacturer to provide a full perimeter 6 inch or taller integral base to support and raise all sections of the unit for proper trapping. Base frame shall either be bolted construction or welded construction. Refer to schedule for base height and construction type. Contractor will be responsible for providing a housekeeping pad when unit base frame is not of sufficient height to properly trap unit. Unit base frames not constructed of galvanized steel shall be chemically cleaned and coated with both a rust-inhibiting primer and finished coat of rust-inhibiting enamel. Unit base height to be included in total height required for proper trap height.

2.03 UNIT CASING

A. Unit manufacturer shall ship unit in segments as specified by the contractor for ease of installation in tight spaces. The entire air handler shall be constructed of galvanized steel. Casing finished to meet ASTM B117 250-hour salt-spray test. The removal of access panels or access doors shall not affect the structural integrity of the unit. All removable panels shall

be gasketed. All doors shall have gasketing around full perimeter to prevent air leakage. Contractor shall be responsible to provide connection flanges and all other framework that is needed to properly support the unit.

B. Unit casing (wall/floor/roof panels and doors) shall be able to withstand up to 1.5 times design static pressure, or 8-inch w.g., whichever is less, and shall not exceed 0.0042 per inch of panel span (L/240).

C. Floor panels shall be double-wall construction and designed to support a 300-lb load during maintenance activities and shall deflect no more than 0.0042 per inch of panel span.

D. Unit casing panels shall be 2-inch double-wall construction, with solid galvanized exterior and solid galvanized interior, to facilitate cleaning of unit interior.

E. Unit casing panels (roof, walls, floor) and doors shall be provided with a minimum thermal resistance (R-value) of 13 Hr*Ft2*°F/BTU.

F. Unit casing panels (roof, walls, floor) and external structural frame members shall be completely insulated filling the entire panel cavity in all directions so that no voids exist. Panel insulation shall comply with NFPA 90A.

G. Casing panel inner liners must not extend to the exterior of the unit or contact the exterior frame. A mid-span, no-through-metal, internal thermal break shall be provided for all unit casing panels.

H. Access panels and/or access doors shall be provided in all sections to allow easy access to drain pan, coil(s), motor, drive components and bearings for cleaning, inspection, and maintenance.

I. Access panels and doors shall be fully removable without the use of specialized tools to allow complete access of interior surfaces.

2.04 OUTDOOR UNIT FEATURES

A. Outdoor Casing Details - In addition to all other details specified within for air handling units, units that are installed outdoors shall also comply with the following -
   1. Outdoor air handling units shall have only single door handles for each door linking multiple latching points necessary to maintain the specified air leakage integrity of the unit and ease of maintenance.
   2. Unit Paint - External surfaces of all outdoor unit casings shall be prepared and painted with a minimum 1.5 mil thick water based polyurethane finish or equal. Paint shall be able to withstand a salt spray test in accordance with ASTM B117 for a minimum of 500 consecutive hours.
   3. Unit Base - Outdoor units shall have a welded base and steel cross members for structural rigidity and supports the full perimeter of the air handling unit. AHU panels must overhang the primary unit base such that no ledge exists for water to pool. The entire AHU perimeter shall be sealed for additional water management protection. A drain pan under the entire unit or sections shall not be an acceptable alternative to prevent water from entering the building space.
   4. Unit Roof - Outdoor unit roofs shall incorporate a standing seam on the exterior to ensure a rigid roof construction and prevent water infiltration. Roof assembly shall overhang all walls by 1.5-inch minimum to prevent sheeting from roof to side panels. Rain gutters shall also be provided over all doors to direct rain away from the door assembly. Outdoor roofs shall be sloped, not less than 0.125 inches per foot, for water drainage. Where outdoor units are shipped in multiple sections, provide standing-seam joiners at each split

with adhesive, hardware, and cover strips for field joining by the installing contractor.

5. Weather Hoods - Outside and exhaust air weather hoods shall be fabricated from the same material as the unit exterior. Hoods shall extend past the perimeter of the unit casing opening to ensure the hood does not obstruct the airflow path. Hoods shall be painted with the same paint requirements identified for the external casing herein.
   a. Outside air inlet hoods for each outside damper shall be provided with a high performance moisture eliminator to prevent entrainment of water into the unit from outside air. Exhaust hoods shall be provided on exhaust air openings and shall include a bird screen.
   b. All hoods shall be sized for 100 percent of nominal damper capacities and with bird screens or similar protection to prevent nesting and entry into AHU inlet or exhaust paths.
6. Provide roof curbs as shown on plans.

2.05 ACCESS DOORS

A. Access doors shall be 2-inch double-wall construction. Interior and exterior shall be of the same construction as the interior and exterior wall panels.

B. All doors downstream of the cooling coil shall be provided with a thermal break construction of door panel and door frame.

C. Gasketing shall be provided around the full perimeter of the doors to prevent air leakage.

D. Door hardware shall be surface-mounted to prevent through-cabinet penetrations that could likely weaken the casing leakage and thermal performance.

E. Handle hardware shall be designed to prevent unintended closure.

F. Access doors shall be hinged and removable without the use of specialized tools.

G. Hinges shall be interchangeable with the door handle hardware to allow for alternating door swing in the field to minimize access interference due to unforeseen job site obstructions.

H. Door handle hardware shall be adjustable and visually indicate locking position of door latch external to the section.

I. All doors shall be a 60-inch high when sufficient unit height is available, or the maximum height allowed by the unit height.

J. A single door handle shall be provided for each door linking multiple latching points necessary to maintain the specified air leakage integrity of the unit.

2.06 PRIMARY DRAIN PANS

A. All cooling coil sections shall be provided with an insulated, double-wall, stainless steel drain pan.

B. The drain pan shall be designed in accordance with ASHRAE 62.1 being of sufficient size to collect all condensation produced from the coil and sloped in two planes, pitched toward drain connections, promoting positive drainage to eliminate stagnant water conditions when unit is installed level and trapped per manufacturer's requirements. See section 2.07, paragraph F through H for specifications on intermediate drain pans between cooling coils.

C. The outlet shall be located at the lowest point of the pan and shall be sufficient diameter to preclude drain pan overflow under any normally expected operating condition.

D. All drain pan threaded connections shall be visible external to the unit. Threaded connections under the unit floor shall not be accepted.

E. Drain connections shall be of the same material as the primary drain pan and shall extend a minimum 2-1/2-inch beyond the base to ensure adequate room for field piping of condensate traps.

F. The installing contractor is responsible to ensure the unit is installed level, trapped in accordance with the manufacturer's requirements, and visually inspected to ensure proper drainage of condensate.

G. Coil support members inside the drain pan shall be of the same material as the drain pan and coil casing.

H. If drain pans are required for heating coils, access sections, or mixing sections they will be indicated in the plans.

2.07 FANS

A. Fan sections shall have a minimum of one hinged and latched access door located on the drive side of the unit to allow inspection and maintenance of the fan, motor, and drive components. Construct door(s) per Section 2.04.

B. Provide fans of type and class as specified on the schedule. Fan shafts shall be solid steel, coated with a rust-inhibiting coating, and properly designed so that fan shaft does not pass through first critical speed as unit comes up to rated RPM. All fans shall be statically and dynamically tested by the manufacturer for vibration and alignment as an assembly at the operating RPM to meet design specifications. Fans that are selected with inverter balancing shall first be dynamically balanced at design RPM. The fans then will be checked in the factory from 25% to 100% of design RPM to insure they are operating within vibration tolerance specifications, and that there are no resonant frequency issues throughout this operating range. Inverter balancing that requires lockout frequencies inputted into a variable frequency drive to in order to bypass resonant frequencies shall not be acceptable. If supplied in this manner by the unit manufacturer, the contractor will be responsible for rebalancing in the field after unit installation. Fans selected with inverter balancing shall have a maintenance free, circumferential conductive micro fiber shaft grounding ring installed on the fan motor to discharge shaft currents to ground.

C. VFD controlled Direct drive plenum fans with integral frame motors, shall be mounted on isolation bases. Fan shall be dynamically balanced throughout the operating range to a BV-3 (0.20 in/s) per AMCA 204 test standard. Fan and motor shall be internally isolated with spring isolators. A flexible connection shall be installed between fan and unit casing to ensure complete isolation. Flexible connection shall comply with NFPA 90A and UL 181 requirements. If fans and motors are not internally isolated, then the entire unit shall be externally isolated from the building, including supply and return duct work, piping, and electrical connections. External isolation shall be furnished by the installing contractor in order to avoid transmission of noise and vibration through the ductwork and building structure.

D. Direct plenum fans provided with electronically commutated external- rotor motor with integrated control electronics, radial aluminum impeller with backward curved, continuously welded blades.
   1. Individual Fan Assemblies shall be statically and dynamically balanced in two planes as

per DIN / ISO 1940 to balancing grade G 6.3.

2. Fan-to-fan interaction can cause a significant increase in individual fan vibration when mounted to the same structure. Fans applied in an array shall be tested as a system and the total fan vibration shall be less that 0.42 (in/s) RMS including all fan-to-fan interaction. This system effect shall be accounted for by the air handler manufacturer. Individual fan vibration performance values shall not be acceptable.
3. Fan performance shall be rated in accordance with AHRI 430-2020. Fan shall be spaced to minimize aerodynamic fan interaction. Minimum center-to-center spacing between fans shall be 1.6 diameter ratio to ensure proper performance.
4. Fan wheels shall be constructed of materials that comply with UL 1995 requirements of flame and smoke spread per NFPA 90A. The flame spread index not exceeding 25 and a smoke-developed index not exceeding 50.
5. Fan Electrical Power (FEP) rated in accordance with AHRI 430-2020.
6. Motor shall contain integrated PID controller and accept a 0-10VDC input signal for variable speed control.
7. Motorized impeller fan section shall include expanded metal door guard(s) supplied on the access door(s) to the fan. Door guard is intended to deter unauthorized entry and incidental contact with rotating components.
8. Motor efficiency class shall comply with IE4.
9. Fan system manufacturer must stock replacement parts in North America.
10. Fan array shall be designed and constructed for easy field assembly and maintenance. Fan shall be assembled to bulkhead wall with minimal fasteners and the fan shall have quick disconnects for the high voltage and low voltage connections.
11. For units utilizing multiple fans in a fan section, a fan curve shall be provided showing the performance of the entire bank of fans at design conditions. In addition, a fan curve shall be provided showing the performance of each individual fan in the bank of fans at design conditions. Also a fan curve shall be provided showing the performance of the bank of fans, if one fan is down. The percent redundancy of the bank of fans with one fan down shall be noted on the fan curve or in the tabulated fan data.

E. Motors
1. Motors shall meet or exceed all NEMA Standards Publication MG 1 - 2006 requirements and comply with NEMA Premium efficiency levels when applicable. Motors shall comply with applicable requirements of NEC and shall be UL Listed.
2. Fan Motors shall be heavy duty, open drip-proof operable at 460 volts, 60Hz, 3-phase. If applicable, motor efficiency shall meet or exceed NEMA Premium efficiencies.
3. Direct driven fans utilizing integral frame motors shall use 2-pole (3600 rpm), 4-pole (1800 rpm) or 6-pole (1200 rpm) motors, NEMA Design B, with Class B insulation capable to operate continuously at 104 deg F (40 deg C) without tripping overloads.
4. Motors shall have a +/- 10 percent voltage utilization range to protect against voltage variation.

2.08 COILS - GENERAL

A. Coils section header end panel shall be removable to allow for removal and replacement of coils without impacting the structural integrity of the unit.

B. Install coils such that headers and return bends are enclosed by unit casing to ensure that if condensate forms on the header or return bends, it is captured by the drain pan under the coil.

C. Coils shall be manufactured with plate fins to minimize water carryover and maximize airside thermal efficiency. Fin tube holes shall have drawn and belled collars to maintain consistent fin spacing to ensure performance and air pressure drop across the coil as scheduled. Tubes shall be mechanically expanded and bonded to fin collars for maximum thermal conductivity. Use of soldering or tinning during the fin-to-tube bonding process is not acceptable due to the inherent thermal stress and possible loss of bonding at that joint.

D. Construct coil casings of galvanized steel. End supports and tube sheets shall have belled tube holes to minimize wear of the tube wall during thermal expansion and contraction of the tube.

E. All coils shall be completely cleaned prior to installation into the air handling unit. Complete fin bundle in direction of airflow shall be degreased and steam cleaned to remove any lubricants used in the manufacturing of the fins, or dirt that may have accumulated, in order to minimize the chance for water carryover.

F. When two or more cooling coils are stacked in the unit, an intermediate drain pan shall be installed between each coil. The intermediate drain pan shall be designed being of sufficient size to collect all condensation produced from the coil and sloped to promote positive drainage to eliminate stagnant water conditions. The intermediate drain pan shall be constructed of the same material as the sections primary drain pan.

G. The intermediate drain pan shall begin at the leading face of the water-producing device and be of sufficient length extending downstream to prevent condensate from passing through the air stream of the lower coil.

H. Intermediate drain pan shall include downspouts to direct condensate to the primary drain pan. The intermediate drain pan outlet shall be located at the lowest point of the pan and shall be sufficient diameter to preclude drain pan overflow under any normally expected operating condition.

I. Refrigerant Cooling Coils
   1. Refrigerant suction and liquid connections shall be clearly labeled on unit exterior.
   2. Coils shall be proof tested to 450 psig and leak tested to 300 psig air pressure under water. After testing, insides of tubes shall be air dried, charged with dry nitrogen or dry air, and sealed to prevent contamination.
   3. Refrigerant suction and liquid headers shall be constructed of copper tubing. Suction and liquid connections shall penetrate unit casings to allow for sweat connections to refrigerant lines.
   4. Tubes shall be 1/2 inch O.D., minimum .016 inch thick copper. Fins shall be aluminum.
   5. Coils shall have equalizing type vertical distributors sized in conjunction with capacities of coils.

2.09 FILTERS

A. Provide factory-fabricated filter section of the same construction and finish as unit casings. Filter section shall have side access filter guides and access door(s) extending the full height of the casing to facilitate filter removal. Construct doors in accordance with Section 2.04. Provide fixed filter blockoffs as required to prevent air bypass around filters. Blockoffs shall not need to be removed during filter replacement. Filters to be of size, and quantity needed to maximize filter face area of each particular unit size.

B. Filter type, MERV rating, and arrangement shall be provided as defined in project plans and schedule

C. Each filter section shall be provided with a factory-installed, flush-mounted Dwyer dial-type differential pressure gauge piped to both sides of the filter to indicate status. Gauge shall maintain a +/- 5 percent accuracy within operating temperature limits of -20°F to 120°F. Filter sections consisting of pre- and post-filters shall have a gauge for each.

2.10 DAMPERS

A. All dampers shall be internally mounted. Dampers shall be premium ultra low leak and located as indicated on the schedule and plans. Blade arrangement (parallel or opposed) shall be provided as indicated on the schedule and drawings. Dampers shall be Ruskin CD60 double-skin airfoil design or equivalent for minimal air leakage and pressure drop. Leakage rate shall not exceed 3 CFM/square foot at one inch water gauge complying with ASHRAE 90.1 maximum damper leakage and shall be AMCA licensed for Class 1A. All leakage testing and pressure ratings shall be based on AMCA Standard 500-D. Manufacturer shall submit brand and model of damper(s) being furnished, if not Ruskin CD60.

B. Airflow measuring stations shall be provided and located in the outside air paths to measure airflow. Airflow measuring stations shall be tested per AMCA Standard 611 and licensed to bear the AMCA Ratings Seal for airflow measurement performance. Integral control damper blades shall be provided as galvanized steel and housed in a galvanized steel frame. Leakage rate shall not exceed 4 CFM/square foot at one inch water gauge complying with ASHRAE 90.1 maximum damper leakage.
   1. The airflow measurement station shall measure up to 100 percent of the total outside air and/or return air. The airflow measurement station shall be capable of measuring down to 300 fpm. The airflow measuring device shall adjust for temperature variations. Output shall be provided from the station as a 2-10 VDC signal. Signal shall be proportional to air velocity. The accuracy of the measuring station shall be no greater than +/- 5 percent. Airflow measuring stations shall be mounted on the AHU interior.

2.11 ACCESS SECTIONS

A. Access sections shall be provided where indicated in the schedule and plans to allow additional access for inspection, cleaning, and maintenance of unit components. The unit shall be installed for proper access. Procedure for proper access, inspection and cleaning of the unit shall be provided in the AHU manufacturer's maintenance manual. Access section doors shall be constructed per Section 2.04.

2.12 INDIRECT GAS HEAT SECTION

A. Indirect fired gas heaters shall be completely assembled and operationally fire tested at the factory prior to shipment. The heat exchanger tubes shall be constructed from 409 stainless steel. The furnace heat module shall be UL listed, induced draft, and fully modulating. The gas heat section construction shall match the rest of the air handling unit and be an integral part of the unit. All burner and control components shall be housed in a burner vestibule with an access door. The entire section shall bear a UL or CUL label for Commercial-Industrial Gas Heating Equipment (ANSI / UL Standard 705) and furnaces certified to ANSI Z83.8 Gas-fired Duct Furnace and Z2147 Gas-Fired Furnace Standards.

B. Gas heaters shall be fueled by natural gas with at least 20:1 turndown. Burner combustion shall be clean and odor-free throughout the entire operating range. Nitrogen oxide emissions levels shall not exceed 75 ppm. Gas train shall be FM Heater shall be powered by natural gas and shall include force draft exhaust fan on heaters of 1250 output MBH or higher.

C. Field connection requirements include

9 - 14-inch wc gas pressure in appropriate volume
High voltage power as specified (115/1, 200/3, 230/3, 460/3 or 575/3)
Start / Stop dry contact
Modulating 0 - 10v dc control signal
Flue stack (field fabricated/installed)
Condensate drain
Recommended hard wired fan interlock

2.13 MARINE LIGHTS

A. Marine lights shall be provided throughout AHUs as indicated on the schedule and plans. Lights shall be instant-on, light-emitting diode (LED) type to minimize amperage draw and shall produce lumens equivalent to a minimum 75W incandescent bulb (1200 lumens). LED lighting shall provide instant-on, white light and have a minimum 50,000 hr life.

B. Light fixture shall be weather-resistant, enclosed and gasketed to prevent water and dust intrusion.

C. Fixtures shall be designed for flexible positioning during maintenance and service activities for best possible location providing full light on work surface of interest and not being blocked by technician.

D. All lights on a unit shall be wired in the factory to a single on-off switch.

E. Installing contractor shall be responsible for providing 115V supply to the factory-mounted marine light circuit (unless single-point power is specified to be provided by AHU manufacturer).

2.14 CONVENIENCE OUTLETS

A. A 15-amp, 115V GFCI convenience outlet shall be provided by the AHU manufacturer. The outlet shall be separate from the load side of the equipment per NEC requirements. Installing contractor shall be responsible for providing 115V supply to the factory-mounted GFCI outlet circuit per NEC (even when single-point power is specified to be provided by AHU manufacturer).

2.15 VARIABLE FREQUENCY DRIVES (VFDS)

A. Variable frequency drives shall be provided, mounted and wired by the AHU manufacturer as indicated on the schedule and drawings. All standard and optional features shall be included within the VFD enclosure, unless otherwise specified. The VFDs shall be UL listed. The listing shall allow mounting in plenum or other air handling compartments.

B. The VFD shall convert incoming fixed frequency three-phase AC power into a variable frequency and voltage for controlling the speed of three-phase AC motors. The motor current shall closely approximate a sine wave. Motor voltage shall be varied with frequency to maintain desired motor magnetization current suitable for centrifugal pump and fan control and to eliminate the need for motor derating.

C. With the motor's rated voltage applied to the VFD input, the VFD shall allow the motor to produce full rated power at rated amps, RMS fundamental volts, and speed without using the motor's service factor. VFDs utilizing sine weighted/coded modulation (with or without 3rd harmonic injection) must provide data verifying that the motors will not draw more than full load current during full load and full speed operation.

D. The VFD shall include an input full-wave bridge rectifier and maintain a fundamental power factor near unity regardless of speed or load.

E. The VFD and options shall be tested to ANSI/UL Standard 508. The complete VFD, including all specified options, shall be assembled by the manufacturer, which shall be UL 508 certified for the building and assembly of option panels. Assembly of separate panels with options by a third-party is not acceptable. The appropriate UL stickers shall be applied to both the VFD and option panel, in the case where these are not contained in one panel.

F. The VFD shall have DC link reactors on both the positive and negative rails of the DC bus to minimize power line harmonics. VFDs without DC link reactors shall provide a minimum 3% impedance line reactor.

G. The VFDs full load amp rating shall meet or exceed NEC Table 430-150. The VFD shall be able to provide full rated output current continuously, 110% of rated current for 60 seconds and 160% of rated current for up to 0.5 second while starting.

H. The VFD shall be able to provide full torque at any selected frequency from 28 Hz to base speed to allow driving direct drive fans without derating.

I. An automatic energy optimization selection feature shall be provided standard in the VFD. This feature shall automatically and continually monitor the motor¿s speed and load and adjust the applied voltage to maximize energy savings and provide up to an additional 3% to 10% energy savings.

J. Input and output power circuit switching shall be able to be accomplished without interlocks or damage to the VFD. Switching rate may be up to 1 time per minute on the input and unlimited on the output.

K. An automatic motor adaptation test algorithm shall measure motor stator resistance and reactance to optimize performance and efficiency. It shall not be necessary to run the motor or de-couple the motor from the load to run the test.

L. Galvanic and/or optical isolation shall be provided between the VFDs power circuitry and control circuitry to ensure operator safety and to protect connected electronic control equipment from damage caused by voltage spikes, current surges, and ground loop currents. VFDs not including either galvanic or optical isolation on both analog I/O and discrete I/O shall include additional isolation modules.

M. The VFD shall minimize the audible motor noise through the use of an adjustable carrier frequency. The carrier frequency shall be automatically adjusted to optimize motor and VFD efficiencies while reducing motor noise.

N. Protective Features
1. Protection shall be provided against input transients, loss of AC line phase, output short circuit, output ground fault, overvoltage, undervoltage, VFD overtemperature and motor overtemperature. The VFD shall display all faults as words. Codes are not acceptable.
2. The VFD shall be protected from sustained power or phase loss. The VFD shall provide full rated output with an input voltage as low as 90% of the nominal. The VFD shall continue to operate with reduced output with an input voltage as low as 164 V AC for 208/230 volt units, 313 V AC for 460 volt units, and 394 volts for 600 volts units.
3. The VFD shall incorporate a motor preheat circuit to keep the motor warm and prevent condensation build up in the stator.
4. The VFD package shall include semi-conductor rated input fuses to protect power components.
5. To prevent breakdown of the motor winding insulation, the VFD shall be designed to comply with IEC Part 34-17. Otherwise the AHU manufacturer shall ensure that inverter rated motors are supplied.
6. The VFD shall include a "signal loss detection" circuit to sense the loss of an analog input signal such as 4 to 20 mA or 2 to 10 V DC, and shall be programmable to react as desired in such an instance.
7. The VFD shall function normally when the keypad is removed while the VFD is running and continue to follow remote commands. No warnings or alarms shall be issued as a result of removing the keypad.
8. The VFD shall catch a rotating motor operating forward or reverse up to full speed.
9. The VFD shall be rated for 100,000 amp interrupting capacity (AIC).
10. The VFD shall include current sensors on all three output phases to detect and report phase loss to the motor. The VFD shall identify which of the output phases is low or lost.
11. The VFD shall continue to operate without faulting until input voltage reaches 300 V AC on 208/230 volt units, 539 V AC on 460 volt units, and 690 volts on 600 volt units.

O. Interface Features
1. Hand/Start, Off/Stop and Auto/Start selector switches shall be provided to start and stop the VFD and determine the speed reference. On units with bypass, a VFD/Off/Bypass selector switch shall be provided.
2. The VFD shall be able to be programmed to provide a 24 V DC output signal to indicate that the VFD is in Auto/Remote mode.
3. The VFD shall provide digital manual speed control. Potentiometers are not acceptable.
4. A lockable, alphanumeric backlit display keypad shall be provided. The keypad shall be remotely mountable up to 10 feet away using standard 9-pin cable.
5. The keypads for all sizes of VFDs shall be identical and interchangeable.
6. To set up multiple VFDs, it shall be possible to upload all setup parameters to the VFDs keypad, place that keypad on all other VFDs in turn and download the setup parameters to each VFD. To facilitate setting up VFDs of various sizes, it shall be possible to download from the keypad only size independent parameters.
7. The display shall be programmable to display in English, Spanish and French at a minimum.
8. A red FAULT light, a yellow WARNING light and a green POWER-ON light shall be provided. These indications shall be visible both on the keypad and on the VFD when the keypad is removed.
9. A quick setup menu with factory preset typical HVAC parameters shall be provided on the VFD eliminating the need for macros.
10. The VFD shall include a standard EIA-485 communications port and capabilities to be connected at a future date to a Johnson Controls N2 Metasys or Siemens FLN system at no additional cost to the owner. The connection shall be software selectable by the user.
11. At a minimum, the following points shall be controlled and/or accessible:
    a. VFD Start/Stop
    b. Speed reference
    c.Fault diagnostics

d. Meter points

(i)	**Motor power in HP**
(ii)	Motor power in kW
(iii)	Motor kW-hr
(iv)	Motor current
(v)	Motor voltage
(vi)	Hours run
(vii)	2 feedback signals
(viii)	DC link voltage
(ix)	Thermal load on motor
(x)	Thermal load on VFD
(xi)	Heatsink temperature

12. Four additional Form C 230 volt programmable relays shall be available for field installation within the VFD
13. LonWorks® communication shall be available for factory or field installation within the VFD.
14. Two set-point control interfaces (PID control) shall be standard in the unit. The VFD shall be able to look at two feedback signals, compare with two set-points and make various process control decisions.
15. Floating point control interface shall be provided to increase/decrease speed in response to contact closures.
16. Four simultaneous displays shall be available. They shall include frequency or speed, run time, output amps and output power. VFDs unable to show these four displays simultaneously shall provide panel meters.
17. Sleep mode shall be provided to automatically stop the VFD when its speed drops below set ¿sleep¿ level for a specified time. The VFD shall automatically restart when the speed command exceeds the set ¿wake¿ level.
18. The sleep mode shall be functional in both follower mode and PID mode.
19. A run permissive circuit shall be provided to accept a ¿system ready¿ signal to ensure that the VFD does not start until dampers or other auxiliary equipment are in the proper state for VFD operation. The run permissive circuit shall also be capable of sending an output signal as a start command to actuate external equipment before allowing the VFD to start.
20. The following displays shall be accessible from the control panel in actual units: Reference Signal Value, Output Frequency in Hz or percent, Output Amps, Motor HP, Motor kW, kWhr, Output Voltage, DC Bus Voltage, VFD Temperature in degrees, and unit CFM.
21. The display shall be programmed to read in inches of water column (in-wg).
22. The VFD shall be able to be programmed to sense the loss of load and signal a no load/broken belt warning or fault.
23. If the temperature of the VFDs heat sink rises to 80°C, the VFD shall automatically reduce its carrier frequency to reduce the heat sink temperature. If the temperature of the heat sink continues to rise the VFD shall automatically reduce its output frequency to the motor. As the VFDs heat sink temperature returns to normal, the VFD shall automatically

increase the output frequency to the motor and return the carrier frequency to its normal switching speed.

24. The VFD shall have temperature controlled cooling fans for quiet operation and minimized losses.
25. The VFD shall store in memory the last 10 faults and related operational data.
26. Eight programmable digital inputs shall be provided for interfacing with the systems control and safety interlock circuitry.
27. Two programmable relay outputs, one Form C 240 V AC, one Form A 30 V AC, shall be provided for remote indication of VFD status.
28. Three programmable analog inputs shall be provided and shall accept a direct-or-reverse acting signal. Analog reference inputs accepted shall include two voltage (0 to 10 V DC, 2 to 10 V DC) and one current (0 to 20 mA, 4 to 20 mA) input.
29. Two programmable 0 to 20 mA analog outputs shall be provided for indication of VFD status. These outputs shall be programmable for output speed, frequency, current and power. They shall also be programmable to provide a selected 24V DC status indication.
30. Under fire mode conditions, the VFD shall be able to be programmed to automatically default to a preset speed.

P. Adjustments
1. The VFD shall have an adjustable carrier frequency in steps of not less than 0.1 kHz to allow tuning the VFD to the motor.
2. A minimum of sixteen preset speeds shall be provided.
3. Four acceleration and four deceleration ramps shall be provided. Accel and decel time shall be adjustable over the range from 0 to 3,600 seconds to base speed. The shape of these curves shall be automatically contoured to ensure no-trip acceleration and deceleration.
4. Four current limit settings shall be provided.
5. If the VFD trips on one of the following conditions, the VFD shall be programmable for automatic or manual reset: undervoltage, overvoltage, current limit and inverter overload.
6. The number of restart attempts shall be selectable from 0 through 20 or infinitely and the time between attempts shall be adjustable from 0 through 600 seconds.
7. An automatic ¿on delay¿ shall be selectable from 0 to 120 seconds.

Q. Service Conditions
1. VFDs shall provide full output in an ambient temperature from -10 to 50°C (14 to 104°F).
2. VFDs shall provide full output in a relative humidity from 0 to 95%, non-condensing.
3. VFDs shall provide full output up to 3,300 feet elevation without derating.
4. VFDs shall provide full output with an AC line voltage variation from -10 to +10% of nominal voltage.
5. No side clearance shall be required for cooling of any units. All power and control wiring shall be done from the bottom.

R. Warranty
1. The VFD shall be warranted by the manufacturer for a period of 42 months from date of shipment, or 36 months from start-up, which ever occurs first. The warranty shall include parts, labor, travel costs and living expenses incurred by the manufacturer to provide factory-authorized on-site service.

2.16 FACTORY-INSTALLED MOTOR WIRE TERMINATION, VFD, AND COMBINATION STARTER/DISCONNECT ENCLOSURES

A. VFDs shall be factory mounted on the drive side of the fan section. VFD may be mounted on the interior of the unit, accessible from the unit exterior through an access door, or on the casing exterior in a NEMA Type 1 enclosure for indoor units. If not mounted on the fan section due to NEC disconnect height limitations or serviceability constraints in the mechanical equipment room, VFD may be mounted in another location other than the fan.

B. Any welds shall be properly finished with no rough edges. Enclosures shall house circuit breaker disconnects, bypass circuitry, Drive-OFF-Bypass switches, manual speed controls, and control transformers. VFDs and starter/disconnects shall have an external disconnect located on the outside of the access door.

2.17 MOTOR OVERLOAD PANEL FOR FAN ARRAYS

A. A motor overload panel provides a single unit mounted UL508A listed control panel with all fans in an array pre-wired to it, such that one properly sized VFD may be field connected with no additional provisions required for protection of the individual motors. The control panel enclosure will be mounted on the exterior of the fan section and will be NEMA type 1 for indoor units and NEMA type 4 for outdoor units. A single power distribution block shall be provided for connection of the field mounted VFD with one conductor per phase. An electronic motor overload protector with lockable manual isolation switch shall be provided for each motor in the array. Each motor in the array shall be independently grounded with a dedicated green conductor. A minimum of one open ground lug per fan plus one shall be provided for field use. Each motor overload protector shall be provided with an auxiliary contact and all auxiliary contacts will be wired in series to a terminal block for generic trip signaling. The panel will be rated for WYE power systems up to 600V.

2.18 FACTORY WIRING OF LIGHTS, VFDS, AND COMBINATION STARTERS/DISCONNECTS

A. VFDs shall be wired per NEC, UL, and NFPA 90A requirements. Units with factory-mounted controls shall also include power wiring from the VFD or starter/disconnect control transformer to the control system transformers. Units with VFDs and factory-mounted controls shall have a binary start-stop signal and an analog speed signal wired from the direct digital controller to the VFD.

B. All power wiring for voltages greater than 24V and traveling through multiple unit sections shall be contained in an enclosed, metal, power-wiring raceway or EMT. Sections less than 6-inch in length may be contained in FMC.

C. After mounting and wiring of VFDs, on the AHUs, trained factory personnel shall ensure proper operation of each VFD, through a thorough factory test. Testing shall include a Hypot test of unit wiring to ensure that no weaknesses exist in wiring or motor. Each VFD shall be energized and the fan run to ensure the VFD will operate throughout the usable range of the drive and that the fan rotation is correct. Each VFD with bypass shall also be tested in the bypass position to ensure the bypass is operational.

D. For fan motors not supplied with a factory mounted and wired starter or VFD, the unit manufacturer shall supply a 4 X 4 NEMA 4 junction box on the exterior of the fan section(s) with wiring, prewired to the fan motor, to allow for ease of field installation of a starter or VFD.

E. On units provided with factory mounted and wired supply fan starter or VFD and DDC controls, the manufacturer shall provide a single point of power. Line-to-24v transformers shall be provided with sufficient vA to power the unit mounted controller and factory installed control points.

2.19 MOTORIZED IMPELLER CONTROL PANEL

A. The fan section shall be provided with a factory installed NEMA 1 or NEMA 3R motorized impeller motor control panel. The control panel provides a common externally accessible disconnect means, motor over current protection for each fan and a terminal block for ease of control wiring. The box shall include:
   1. Individual motor protection with individual disconnecting means with lockable feature.

Fusible motor protection is not permissible.
2. Fused main panel disconnect with lock out tag out capability
3. Common control terminal block for common signal wiring. Single 0-10vdc signal used for fan speed control.
4. Control panel box shall be UL508a compliant and manufactured by a UL508a approved manufacturer or UL certified during air handler installation.
5. Control panel to include hand/off/auto switch for unit startup and commissioning.
6. Dial potentiometer to be included to for manual speed control in the 'hand' position.
7. Control panel shall be able to operate fans without a BAS signal for purposes of troubleshooting and commissioning.

PART 3 EXECUTION

3.01 SHIPPING

A. A paper copy of the IOM shall be shipped with each AHU.

B. The AHU manufacturer shall identify all shipments with the order number. Enough information shall be provided with each shipment to enable the Contractor to confirm the receipt of units when they are received. For parts too small to mark individually, the AHU manufacturer shall place them in containers.

C. To protect equipment during shipment and delivery, all indoor units shall be completely stretch or shrink wrapped. Wrap shall be a minimum of 7 mil plastic. Pipe ends and pipe connection holes in the casing shall be capped or plugged prior to shipment

D. After loading the equipment for shipment, the AHU manufacturer shall contact the shipping contact on the order and provide the name of the carrier, description of equipment, order number, shipping point, and date of shipment.

3.02 ON-SITE STORAGE

A. If equipment is to be stored for a period of time prior to installation, the Contractor shall remove all stretch or shrink wrap from units upon receipt to prevent unit corrosion and shall either place the units in a controlled indoor environment or shall cover the units with canvas tarps and place them in a well-drained area. Covering units with plastic tarps shall not be acceptable.

3.03 FIELD EXAMINATION

A. The Contractor shall verify that the mechanical room and/or roof are ready to receive work and the opening dimensions are as indicated on the shop drawings and contract documents.

B. The Contractor shall verify that the proper power supply is available prior to starting of the fans.

3.04 INSTALLATION

A. The Contractor shall be responsible to coordinate all of the installation requirements to ensure that a complete installation for each unit is being provided. Coordination efforts shall include such items as unloading and hoisting requirements, field wiring requirements, field piping requirements, field ductwork requirements, requirements for assembly of field-bolted or welded joints, and all other installation and assembly requirements.

B. The AHU manufacturer shall provide all screws and gaskets for joining of sections in the field.

C. The Contractor shall verify that the following items have been completed prior to scheduling the AHU manufacturer's final inspection and start up:
   1. All spring-isolated components have had their shipping restraints removed and the components have been leveled.
   2. On all field-joined units, that all interconnections have been completed, i.e., electrical and control wiring, piping, casing joints, bolting, welding, etc.
   3. All ductwork connections have been completed and all ductwork has been pressure tested for its intended service.
   4. All power wiring, including motor starters and disconnects, serving the unit has been completed.
   5. All automatic temperature and safety controls have been completed.
   6. All dampers are fully operational.
   7. All shipping materials have been removed.
   8. All (clean) filter media has been installed in the units.

3.05 LEVELING

A. The Contractor shall level all unit sections in accordance with the unit manufacturer’s instructions. The Contractor shall provide and install all necessary permanent shim material to ensure individual sections and entire assembled units are level.

3.06 FINAL INSPECTION AND START UP SERVICE

A. After the Contractor has provided all piping connections, ductwork connections, and field control wiring, and Contractor has provided all the field power wiring, the Contractor shall inspect the installation. The Contractor shall then perform startup of the equipment.

B. The Automatic Temperature Control (Building Direct Digital Control) Contractor shall be scheduled to be at the job site at the time of the equipment start up.

C. The Contractor, shall perform the following tests and services and submit a report outlining the results:
   1. Record date, time, and person(s) performing service.
   2. Lubricate all moving parts.
   3. Check all motor and starter power lugs and tighten as required.
   4. Verify all electrical power connections.
   5. Conduct a start up inspection per the AHU manufacturer's recommendations.
   6. Record fan motor voltage and amperage readings.
   7. Check fan rotation and spin wheel to verify that rotation is free and does not rub or bind.
   8. Check fan for excessive vibration.
   9. Remove all foreign loose material in ductwork leading to and from the fan and in the fan itself.
   10. Disengage all shipping fasteners on vibration isolation equipment.
   11. Check safety guards to insure they are properly secured.
   12. Secure all access doors to the fan, the unit and the ductwork.
   13. Switch electrical supply "on" and allow fan to reach full speed.
   14. Physically check each fan at start up and shut down to insure no abnormal or problem conditions exist.
   15. Check entering and leaving air temperatures (dry bulb and wet bulb) and simultaneously record entering and leaving chilled water temperatures and flow, steam pressures and flow, and outside air temperature.
   16. Check all control sequences.

END OF SECTION

SECTION 23 74 16.13
PACKAGED LARGE CAPACITY ROOFTOP AIR CONDITIONING UNITS (AC-1 & AC-2)

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Packaged rooftop unit.

B. Heat exchanger.

C. Refrigeration components.

D. Unit operating controls.

E. Roof curb.

F. Electrical power connections.

G. Operation and maintenance service.

1.02 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

A. Controls and Instrumentation: Installation and wiring of thermostats and other control components.

B. Section 16180 - Equipment Wiring Systems: Electrical connection of equipment.

1.04 REFERENCES

A. ANSI/NFPA 90A - Installation of Air Conditioning and Ventilation Systems.

B. AHRI 340 / 360 - Unitary Air-Conditioning Equipment.

C. ANSI/ASHRAE/IESNA 90.1 - Energy Standard for New Buildings Except Low-Rise Residential Buildings.

D. California Administrative Code - Title 24

1.05 SUBMITTALS

A. Submit drawings indicating components, dimensions, weights and loadings, required clearances, and location and size of field connections.

B. Submit product data indicating rated capacities, weights, accessories, service clearances and electrical requirements.

C. Submit manufacturer's installation instructions.

1.06 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data.

B. Include manufacturer's descriptive literature, start-up and operating instructions, installation instructions, and maintenance procedures.

1.07 HANDLING

A. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.

B. Protect units from physical damage. Leave factory shipping covers in place until installation.

1.08 WARRANTY

A. Provide a parts and labor warranty for one year from start-up or 18 months from shipment, whichever occurs first.

B. Provide an extended 2nd through 5th year compressor parts only warranty.

1.09 REGULATORY REQUIREMENTS

A. Unit shall conform to cULus for construction of packaged air conditioner and shall have cULus label affixed to rooftop package.
   1. In the event the unit is not cULus approved, the manufacturer shall, at his expense, provide for a field inspection by a cULus representative to verify conformance to cULus standards. If necessary, contractor shall perform required modifications to the unit to comply with cULus, as directed by the cULus representative, at no additional expense to the Owner.

1.10 SUMMARY

A. The contractor shall furnish and install packaged rooftop air conditioning unit(s) as shown and as scheduled on the contract documents. The unit(s) shall be installed in accordance with this specification and perform at the conditions specified, scheduled or as shown on the contract drawings.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. GENERAL
   1. Manufacturer of packaged unitary rooftop products shall have had a minimum of five years successful experience in the manufacture and service support of the rooftop packages specified herein. Manufacturers with less than five years' experience in the production of rooftop units of the sizes and types specified shall not be acceptable.

****

Choose only one of the following OR paragraphs:

****

B. Approved Manufacturers
   1. Trane model SXHL or Equal.

2.02 GENERAL UNIT DESCRIPTION

A. Unit(s) furnished and installed shall be cooling only packaged rooftops as specified on the contract documents and within these specifications. Cooling capacity ratings shall be based upon AHRI Standard 360. Unit(s) shall consist of insulated weathertight casing with compressors, air cooled condenser coil, condenser fans, evaporator coil, filters, supply and exhaust fan motors and drives, and unit controls.

B. Unit(s) shall be single piece construction as manufactured at the factory. Package units shall be constructed for installation on a roof curb providing full perimeter support under air handler section and pedestal support under condenser section.

C. Unit(s) shall be factory run tested to include the operation of all fans, compressors, heat exchangers, and control sequences.

D. Unit(s) shall have labels, decals, and/or tags to aid in the service of the unit and indicate caution areas.

2.03 UNIT CASING

A. Cabinet: Galvanized steel, phosphatized, and finished with an air-dry paint coating durable enough to withstand a minimum of 672 consecutive-hour salt spray application in accordance with standard ASTM B 117. Structural members shall be heavy gauge with access doors and removable panels of heavy gauge steel. Roof panels shall be sloped to provide positive drainage.

B. Hinged Access Doors: Fully gasketed hinged doors with fluted knob fasteners and chained "tie-backs" to provide access to filters, heating section, return/exhaust air fan section, supply air fan section and evaporator coil section. These access doors shall feature double wall construction with dual density insulation sandwiched between heavy gauge galvanized steel panels for strength and durability.

C. Unit shall use double wall construction in the air handling section. The sheet metal liners shall provide a mechanical fastener for insulation and prevent the possibility of loose insulation fibers from entering the airstream. 16 gauge exterior liners shall be welded to 20 gauge interior liners. All interior airstream insulation shall be lined, with the exception of the vertical supports, which have foil faced insulation. cULus approved.

D. The high voltage control panel shall be provided with a door handle disconnect switch to facilitate convenient, safe disconnection of main three phase power.

E. Unit base shall be formed structural steel members of minimum 12 gauge galvanized steel. Unit base shall be welded and shall incorporate integral tie down/lifting fixture on each side (2 each). Fixtures shall be bolted into frame and welded on all exterior surfaces.

2.04 ELECTRICAL POWER CONNECTIONS

A. Provide Phase and Voltage Monitor. Shall protect 3-phase equipment from phase loss, phase reversal, and low voltage. Any fault condition will produce a Failure Indicator LED, and send the unit into an emergency stop condition. cULus approved.

B. Provide unit mounted 115 volt powered convenience outlet.

C. Provide Non-Fused Disconnect Switch with External Handle. External handle shall enable the operator to disconnect unit power with the control box door closed for safety

D. Provide Unit Interrupt Rating (Short Circuit Current Rating-SCCR). A 5,000 Amp rating Amp rating shall be applied to the unit enclosure using a non-fused circuit breaker for disconnect switch purposes. Fan motors, compressors, and electric heat circuits shall be provided with series rated circuit breakers that will provide the unit rated level of protection. The unit shall be marked with approved cULus markings and will adhere to cULus regulations

2.05 PRE-EVAPORATOR COOLER AIR FILTERS

A. Air Filters: Filters shall mount integral within unit casing and be accessible via hinged access panels.

B. Provide a factory-installed, dial-type, differential pressure gauge that shall be piped to both sides of the filter to indicate status. Gauge shall maintain a +/- 5 percent accuracy within operating temperature limits of -20°F to 120°F. Gauge shall be flush-mounted with casing outer wall. Filter sections consisting of pre- and post-filters shall have a gauge for each.

C. Provide high efficiency throw-away filters. Filters shall be U.L. Class 2, 2.0" nominal thickness, pleated media type, with a MERV rating of 8 per ASHRAE 52.2. Filters shall be mounted in a galvanized steel filter rack.

2.06 FANS - SUPPLY - AND/OR EXHAUST OR RETURN

A. Supply Fan
   1. Supply fan shall be two single width, single inlet 9-blade plenum fan. Fan blades shall be aluminum backward-inclined airfoil. Plenum fans shall be beltless and direct-driven. Entire assembly shall be completely isolated from unit and fan board by 2 in deflection spring isolation. Multiple fan widths shall be available to optimize efficiency. Fan shall not require routine maintenance such as fan bearing lubrication, belt tensioning and replacement, sheave alignment, and setscrew torque checks. Belt driven plenums shall not be acceptable.

B. Mount fan motor(s) and fan on a common base assembly and isolated from unit with 2” deflection spring isolators.

C. Provide thrust restraint isolation on the fan housing/fan board to assure smooth fan startup transition and operation.

D. Fan shaft shall be mounted on grease lubricated ball bearings.

E. Motor shall have a standard T-frame and a minimum service factor of 1.15. All drive components shall be accessible without the use of scaffolds or ladders, to facilitate periodic maintenance checks and for operator safety.

F. Provide Internal Shaft Grounding Ring. Motors shall have internal bearing protection for use with VFDs

G. Provide Extended grease lines to allow greasing of bearings from unit filter section. Fan motor and assembly shall be mounted on common base to allow consistent belt tension with no relative motion between fan and motor shafts. On motor sizes larger than 5 hp entire assembly shall be completely isolated from unit and fan board by double deflection, rubber in shear isolators or spring isolation.

2.07 EVAPORATOR COIL SECTION

A. Provide heavy duty aluminum fins mechanically bonded to copper tubes. Evaporator coil shall be inter- circuited to maintain active coil face area at part load conditions. Coil shall also utilize internally enhanced tubing for maximum efficiency.

B. Provide a thermostatic expansion valve (TXV) for each refrigerant circuit. Factory pressure and leak test coil.

C. Provide non-sloped drain pan with drains on both sides of the unit.

D. Provide double sloping stainless steel drain pan. Pan shall provide protection in corrosive environments and promote runoff of standing water from condensation inside the unit. Two drain pipes shall be installed through the base channel on each side of the unit. The evaporator drain pan shall be constructed of a minimum of 14 gauge stainless steel.

2.08 AIR-COOLED CONDENSER SECTION

A. Condenser coils shall have all Aluminum Microchannel coils. All coils shall be leak tested at the factory to ensure pressure integrity. The condenser coil is pressure tested to 650 psig. Subcooling circuit(s) shall be provided as standard.

B. Provide subcooling circuit(s) integral with condenser coils to maximize efficiency and prevent premature flashing of liquid refrigerant, to a gaseous state, ahead of the expansion valve.

C. Provide vertical discharge, direct drive fans with steel blades, and three phase motors. Fans shall be statically and dynamically balanced. Motors shall be permanently lubricated, with built-in current and thermal overload protection and weathertight slinger over motor bearings.

D. Furnish unit with factory-installed electronic low ambient option to allow for operation down to 0 degrees F.

E. Provide factory-installed louvered steel hail/vandal guards around perimeter of condensing section to protect the condenser coils, refrigerant piping and control components. Louvered panels shall be fabricated from heavy gauge galvanized steel and be rigid enough to provide permanent protection for shipping and pre-/post- installation. Course wire mesh is not an acceptable material for coil guards.

2.09 REFRIGERATION SYSTEM

A. Compressor: shall be industrial grade, energy efficient direct drive 3600 RPM maximum speed scroll type. The motor shall of a suction gas cooled hermetic design. Compressor shall have centrifugal oil pump with dirt separator, oil sight glass, and oil charging valve.

B. Provide with thermostatic motor winding temperature control to protect against excessive motor temperatures resulting from over-/under-voltage or loss of charge. Provide high and low pressure cutouts, and reset relay.

C. Provide factory-installed compressor lockout thermostat to prevent compressor operation at low ambient conditions.

D. Provide coil frost protection compressor unloading based on refrigerant circuit suction temperature to prevent coil frosting with minimum energy usage. As an alternate, factory-installed hot gas bypass shall be required on all VAV units to prevent coil frosting.

E. The Trane eFlex variable speed compressor shall be capable of speed modulation from 25 Hz to a maximum of 100 Hz for 200/230/460V or 30 Hz to a maximum of 90 Hz for 575V. The minimum unit capacity shall be 15% of full load or less. The compressor motor shall be a permanent magnet type. Each compressor shall have a crankcase heater installed and sized to minimize the amount of liquid refrigerant present in the oil sump during off cycles. Compressors shall be equipped with a thrust bearing oil injection system that optimizes scroll set lubrication and controls the oil circulation rate. Optimal bearing lubrication shall be provided by a gear motor oil pump. Each variable speed compressor shall be matched with a specially designed variable frequency drive which modulates the speed of the compressor motor and provides several compressor protection functions. Control of the variable speed compressor and inverter control shall be integrated with the IPak unit controller to ensure optimal equipment reliability and efficiency.

2.10 EXHAUST/RETURN SECTION

A. 100% Power Exhaust with Statitrac :
   1. Provide all of the specifications above as well as direct space sensing building pressurization control. The (Statitrac) control system shall modulate the Exhaust fan VFD or discharge dampers to control the building pressure to within the adjustable, specified deadband that shall be adjustable at the Human Interface Panel.

2.11 OUTDOOR AIR SECTION

A. Provide 0-100 Percent Modulating Economizer. Shall be operated through the primary temperature controls to automatically utilize OA for "free" cooling. Automatically modulated RA and OA dampers shall maintain proper temperature in the space. Economizer shall be equipped with an automatic lock out when the outdoor high ambient temperature is too high for proper cooling. Minimum position control shall be standard and adjustable at the Human Interface Panel or with a remote potentiometer or through the building management system. A spring return motor shall ensure closure of OA dampers during unit shutdown or power interruption. Mechanical cooling shall be available to aid the economizer mode at any ambient. Control shall be through Dry Bulb.

B. Provide demand control ventilation (DCV) system fully integrated with unit economizer. Controller shall minimize fresh air intake during periods of low occupancy based on parts per million space CO2 in response to a customer defined parts per million CO2 setpoint. CO2 setpoint, and minimum DCV fresh air damper position shall be programmable at the human interface, or building management system.

C. Provide adjustable minimum position control through the minimum potentiometer.

D. Provide Outside Air Measurement. A factory mounted airflow measurement station (Traq) shall be provided in the outside air opening to measure airflow. The airflow measurement station shall measure from 15 to 100 percent of unit airflow. The airflow measurement station shall adjust for temperature variations

2.12 DAMPERS

A. Leakage rate shall be determined in accordance with AMCA Standard 500.

B. Title 24 Compliance.
   1. Provide Ultra Low Leak Dampers. Dampers shall be AMCA 511 Class 1A certified with a maximum leakage rate of 3 cfm/sq-ft at 1.0 in WC pressure differential thus exceeding requirements of ASHRAE 90.1-2013, California Title 24-2013, and IECC-2012

2. Provide Fault Detection and Diagnostic (FDD) control. FDD control shall monitor the commanded position of the economizer compared to the feedback position of the damper. If the damper position is outside +/- 10% of the commanded position, a diagnostic is generated.
3. Provide units with ultra-low leak dampers which shall be listed on the California Energy Commission Registry for factory compliance with Title 24 Economizer and FDD requirements. The economizer shall have a functional life of 60,000 opening and closing cycles. A label will be applied to the unit identifying construction with the ultra-low leak economizer and FDD controls.

2.13 DDC MICROPROCESSOR CONTROLS

A. General - Each unit shall be provided with a factory-installed, programmed and run-tested, stand-alone, microprocessor control system suitable for CV, SZVAV or VAV control as required. This system shall consist of temperature and pressure (thermistor and transducer) sensors, printed circuit boards, and a unit-mounted Human Interface Panel. The microprocessor shall be equipped with on-board diagnostics to indicate that all hardware, software, and all interconnected wiring and sensors are in proper operating condition. The microprocessor's memory shall be non-volatile EEPROM type, thus requiring no battery or capacitive backup to maintain all data during a power loss.

B. The Human Interface Panel shall be readily accessible for service diagnosis and programming without having to open the main control panel on the rooftop unit. Alphanumeric coded displays shall not be acceptable.
1. Human Interface (HI) Panel - shall be a 16 key touch-sensitive membrane key switch panel, password protected to prevent use by unauthorized personnel. The Human Interface Panel display shall consist of a 2 line by 40 characters per line clear English display. The display shall be Liquid Crystal Display (LCD) with blue characters, 5 X 7 dot matrix with cursor, on a gray-green background for high visibility and reading ease.

C. Anti-recycle Protection - shall be provided to prevent excessive cycling, and premature wear, of the compressors, contactors and related components.

2.14 MISCELLANEOUS FEATURES

A. Rapid Restart Option - Option shall provide immediate start-up upon power failure. A backup generator is required on site before unit start-up. Rapid Restart will begin immediately after recovery from a power loss and work by restarting the compressors and supply fan quickly, providing full cooling within two to three minutes.

2.15 BUILDING MANAGEMENT SYSTEM

A. Provide factory mounted BACnet MS/TP control interface to operate with the 3rd party Building Automation System. Communication link shall use a two-wire twisted pair.\
1. Manufacturer shall include 4 hours of onsite integration assistance.

B. Control Functions: Includes unit time scheduling, occupied/unoccupied mode, optimal start/stop, night-time free-cooling purge mode, two-step demand limiting, night setback, morning warmup, discharge air set point adjustment, universal smoke purge, building pressurization, timed override and alarm shutdown.

C. Diagnostic Functions shall include the following as applicable:
1. RTM temp sensor fail
2. Heat failure
3. Supply air temp sensor fail

4. Unocc zone cool stpt fail
5. RTM auxiliary temp sensor fail
6. Unocc zone heat stpt fail
7. OA temp sensor failure
8. Supply sir press stpt fail
9. Mode input failure
10. Spc static press stpt fail
11. Occ zone cool setpoint fail
12. Space press sensor fail
13. Occ zone heat setpoint fail
14. Return air temp sensor fail
15. Supply air pressure sensor fail
16. RA humidity sensor fail
17. OA humidity sensor fail
18. Supply air static press limit
19. Emergency stop
20. SCM communications fail
21. Supply fan fail
22. MCM communications fail
23. Exhaust fan fail
24. Heat module comm fail
25. Evap temp sensor fail
26. ECEM communications fail
27. Evap temp sensor fail - Ckt 1
28. Evap temp sensor fail - Ckt 2
29. GBAS module comm fail
30. TCI module comm fail
31. Low press control open
32. Low press control open - Ckt 1
33. Low press control open - Ckt 2
34. Tracer communications fail
35. NSB panel communications
36. Remote HI communications fail
37. Cond temp sensor fail
38. Cond temp sensor fail - Ckt 1
39. Cond temp sensor fail - Ckt 2
40. Unit HI communications fail
41. VOM communications fail
42. Compressor contactor fail
43. Comp. contactor fail - Ckt 1
44. Comp. contactor fail - Ckt 2
45. Compressor trip
46. Compressor trip - Ckt 1
47. Compressor trip - Ckt 2
48. Supply air temp cool stpt fail
49. Supply air temp heat stpt fail
50. Morning warmup zone sensor fail
51. Freezestat trip
52. Dirty filter
53. NSB panel zone temp sensor fail

C. BAS control shall permit auto reset of latching diagnostics.

2.16 ROOF CURB

A. Provide factory supplied roof curb as noted on the drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that roof is ready to receive work and opening dimensions are as required.

B. Verify that proper power supply is available.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Mount units on factory built roof mounting frame providing watertight enclosure to protect ductwork. Install roof mounting curb level.

3.03 MANUFACTURER'S FIELD SERVICES

A. OEM Startup is required and shall be performed by factory service technicians confirming equipment has been correctly installed and passed specification checklist prior to equipment becoming operational.

END OF SECTION

This page intentionally left blank

SECTION 23 81 26
SPLIT-SYSTEM AIR CONDITIONERS

PART 1 - GENERAL

1.01 SYSTEM DESCRIPTION PUZ SERIES

A. The heat pump air conditioning system shall be a Mitsubishi Electric split system with Variable Speed Inverter Compressor technology or equal. The system shall consist of a horizontal discharge, single phase outdoor unit, a matched capacity indoor section that shall be equipped with a wired wall-mounted, wireless wall-mounted, wireless handheld, or other remote controller.

1.02 QUALITY ASSURANCE

A. The system components shall be tested by a Nationally Recognized Testing Laboratory (NRTL) and shall bear the ETL label.

B. All wiring shall be in accordance with the National Electrical Code (N.E.C.).

C. The units shall be rated in accordance with Air-conditioning, Heating and Refrigeration Institute's (AHRI) Standard 240 and bear the AHRI Certification label.

D. The units shall be manufactured in a facility registered to ISO 9001 and ISO 14001, which is a set of standards applying to product and manufacturing quality and environmental management and protection set by the International Standard Organization (ISO).

E. A dry air holding charge shall be provided in the indoor section.

1.03 DELIVERY, STORAGE AND HANDLING

A. Unit shall be stored and carefully handled according to the manufacturer's recommendations.

B. The wireless remote controller, for the wall mounted and floor standing indoor units, shall be shipped inside the carton and packaged with the indoor unit and shall be able to withstand 105°F storage temperatures and 95% relative humidity without adverse effect.

C. The remote controller, for the ceiling suspended, ceiling recessed and ducted indoor units, either wireless or wired, shall be shipped separately.

PART 2 - WARRANTY

A. The units shall have a manufacturer's parts and defects warranty for a period five (5) years from date of installation. The compressor shall have an extended warranty of seven (7) years from date of installation.

B. If, during this period, any part should fail to function properly due to defects in workmanship or material, it shall be replaced or repaired at the discretion of the manufacturer. This warranty will not include labor.

D. All manufacturer technical and service manuals must be readily available for download by any local contractor should emergency service be required.

PART 3 - OUTDOOR UNITS

3.01 PUZ SYSTEM

A. General:
1. The PUZ Series outdoor units are specifically designed to work with the wall mounted, ducted, 4-way cassette, ceiling suspended and multi-position air handler indoor units. The connected indoor unit shall be of the same capacity as the outdoor unit. The outdoor units must have a thermally fused powder coated finish. The outdoor unit shall be completely factory assembled, piped and wired. Each unit shall be run tested at the factory.
2. If an alternate manufacturer is selected, any additional material, cost, and labor to install additional lines shall be incurred by the contractor. Contractor responsible for ensuring alternative brand compatibility in terms of availability, physical dimensions, weight, electrical requirements, etc.
3. Outdoor unit shall have a sound rating no higher than 53 dB(A). If an alternate manufacturer is selected, any additional material, cost, and labor to meet published sound levels shall be incurred by the contractor.
4. Refrigerant lines from the outdoor unit to the indoor units shall be insulated in accordance with the installation manual.
5. The outdoor unit shall meet performance requirements per schedule and be within piping limitations & acceptable ambient temperature ranges as described in respective manufacturers' published product catalogs. Non-published product capabilities or performance data are not acceptable.
6. The outdoor unit shall be capable of guaranteed operation in heating mode down to -13°F ambient temperatures and cooling mode up to 115°F without additional restrictions on line length & vertical separation beyond those published in respective product catalogs. Models with capacity data for required temperature range published as "for reference only" are not considered capable of guaranteed operation and are not acceptable. If an alternate manufacturer is selected, any additional material, cost, and labor to meet ambient operating range and performance shall be incurred by the contractor.

B. Unit Cabinet:
1. The casing shall be fabricated of galvanized steel, bonderized, finished with an electrostatically applied, thermally fused acrylic or polyester powder coating for corrosion protection. Assembly hardware shall be cadmium plated for weather resistance.
2. Cabinet color shall be Munsell 3Y 7.8/1.1.
3. Easy access shall be afforded to all serviceable parts by means of removable panel sections.
4. Two (2) mild steel mounting feet, traverse mounted across the cabinet base pan, welded mount, providing four (4) slotted mounting holes shall be furnished. Assembly shall withstand lateral wind gust up to 155 MPH to meet applicable weather codes. The casing(s) shall be fabricated of galvanized steel, bonderized and finished.

C. Fan:
1. 1, 1.5, 2 and 2.5 ton units shall be furnished with a single direct drive propeller type fan. 3, 3.5 ton units shall be furnished with a two (2) direct drive propeller type fans.
2. The outdoor unit fan motor(s) shall be a direct current (DC) motor and have permanently lubricated bearings.
3. The fan motor shall be mounted for quiet operation.
4. The fan shall be provided with a raised guard to prevent contact with moving parts.
5. The outdoor unit shall have horizontal discharge airflow.

D. Refrigerant and Refrigerant Piping:
1. R410A refrigerant shall be required for systems.

2. Polyolester (POE) oil—widely available and used in conventional domestic systems—shall be required. Prior to bidding, manufacturers using alternate oil types shall submit material safety data sheets (MSDS) and comparison of hygroscopic properties for alternate oil with list of local suppliers stocking alternate oil for approval at least two weeks prior to bidding.
3. Refrigerant piping shall be phosphorus deoxidized copper (copper and copper alloy seamless pipes) of sufficient radial thickness as defined by the equipment manufacturer and installed in accordance with manufacturer recommendations.
4. All refrigerant piping must be insulated with ½" closed cell, CFC-free foam insulation with flame-Spread Index of less than 25 and a smoke-development Index of less than 50 as tested by ASTM E 84 and CAN / ULC S-102. R value of insulation must be at least 3.
5. Refrigerant line sizing shall be in accordance with manufacturer specifications.

E. Coil:
1. The outdoor unit coil shall be of nonferrous construction with lanced or corrugated plate fins on copper tubing.
2. The coil shall be protected with an integral metal guard.
3. Refrigerant flow from the outdoor unit shall be regulated by means of an electronically controlled, precision, linear expansion valve.
4. All refrigerant lines between outdoor and indoor units shall be of annealed, refrigeration grade copper tubing, ARC Type, meeting ASTM B280 requirements, individually insulated in twin-tube, flexible, closed-cell, CFC-free (ozone depletion potential of zero), elastomeric material for the insulation of refrigerant pipes and tubes with thermal conductivity equal to or better than 0.27 BTU-inch/hour per Sq Ft / °F, a water vapor transmission equal to or better than 0.08 Perm-inch and superior fire ratings such that insulation will not contribute significantly to fire and up to 1" thick insulation shall have a Flame-Spread Index of less than 25 and a Smoke-development Index of less than 50 as tested by ASTM E 84 and CAN / ULC S-102.
5. All refrigerant connections between outdoor and indoor units shall be flare type.

F. Compressor:
1. The compressor shall be a high performance, hermetic, inverter driven, variable speed, dual rotary type manufactured by Mitsubishi Electric Corporation.
2. The compressor motor shall be direct current (DC) type equipped with a factory supplied and installed inverter drive package.
3. The compressor will be equipped with internal thermal overload protection.
4. To prevent liquid from accumulating in the compressor during the off cycle, a minimal amount of current shall be automatically, intermittently applied to the compressor motor windings to maintain sufficient heat to vaporize any refrigerant. No crankcase heater is to be used.
5. Filters, sight glasses, and traps shall not be used, and no additional refrigerant oil shall be required.
6. The compressor shall be mounted so as to avoid the transmission of vibration.
7. The outdoor unit shall have an accumulator and high-pressure safety switch.

G. Operating Range:
1. Operating Range shall be in accord with the Table below:

Operating Range		Indoor Intake Air Temp	Outdoor Intake Air Temp
Cooling	Maximum	95°F (35°C) DB, 71°F(21°C) WB	115°F (46°C) DB
	Minimum	67°F (19°C) DB, 57°F(14°C) WB	14°F (-10°C) DB
Heating		Locked	

H. Electrical:
1. The outdoor unit electrical power supply shall be 208/230 volts, 1-phase, 60 hertz.
2. The unit shall be capable of satisfactory operation within voltage limits of 198 volts to 253 volts.
3. The outdoor unit shall be controlled by microprocessors located in the indoor unit and outdoor unit. A 12 to 24 volt DC data stream shall communicate between the units providing all necessary information for full function control.
4. The outdoor unit shall be equipped with Pulse Amplitude Modulation (PAM) compressor inverter drive control for maximum efficiency with minimum power consumption.

PART 4 - INDOOR UNITS

4.01 PKA WALL MOUNTED INDOOR UNIT

A. General:
1. The wall-mounted indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, and a test run switch. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.

B. Unit Cabinet:
1. All casings, regardless of model size, shall have the same Munsell 1.0Y 9.2/0.4 white finish
2. Multi directional drain and refrigerant piping offering four (4) directions for refrigerant piping and two (2) directions for draining are required.
3. There shall be a separate back plate which secures the unit firmly to the wall.

C. Fan:
1. The indoor fan shall be statically and dynamically balanced to run on a single motor with permanently lubricated bearings.
2. A manual adjustable guide vane shall be provided with the ability to change the airflow from side to side (left to right).
3. An integral, motorized, multi-position, horizontal air sweep vane shall provide for uniform air distribution, up and down. Vane shall have 5 selectable positions plus AUTO (Controls position based upon mode, microprocessor shall automatically determine the vane angle to provide the optimum room temperature distribution) and SWING (Continuously moves up and down). In OFF mode the horizontal vane shall return to the closed position.
4. The indoor unit shall include an AUTO fan setting capable of maximizing energy efficiency by adjusting the fan speed based on the difference between controller set-point and space temperature. The indoor fan shall be capable of five (5) speed settings, Low, Mid1, Mid2, High and Auto.

D. Filter:
   1. Return air shall be filtered by means of an easily removable, washable filter.

E. Coil:
   1. The indoor unit coil shall be of nonferrous construction with smooth plate fins on copper tubing.
   2. The tubing shall have inner groves for high efficiency heat exchange.
   3. All tube joints shall be brazed with silver alloy.
   4. The coils shall be pressure tested at the factory.
   5. A sloped, corrosion resistant condensate pan with drain shall be provided under the coil.

F. Electrical:
   1. The unit electrical power shall be 208-230 volts, 1-phase, 60 hertz.
   2. The system shall be equipped with A-Control – a system directing that the indoor unit be powered directly from the outdoor unit using a 3-wire, 14-gauge AWG connections plus ground.
   3. The indoor unit shall not have any supplemental electrical heat elements.

G. Controls:
   1. The unit shall include an IR receiver for wireless remote-control flexibility
   2. Indoor unit shall compensate for the higher temperature sensed by the return air sensor compared to the temperature at level of the occupant when in HEAT mode. Disabling of compensation shall be possible for individual units to accommodate instances when compensation is not required.
   3. Control board shall include contacts for control of external heat source. External heat may be energized as second stage when the space temperature is 1.8°F from set point.

END OF SECTION

This page intentionally left blank

SECTION 23 81 29

VARIABLE-REFRIGERANT-FLOW HVAC SYSTEMS

PART 1 - GENERAL

1.01 SYSTEM DESCRIPTION Y-SERIES RAPID CHANGEOVER

A. Per the equipment schedule, the variable capacity, heat pump or heat recovery air conditioning system basis of design is Mitsubishi Electric CITY MULTI VRF (Variable Refrigerant Flow) zoning system(s). In order to maintain optimal tenant comfort during periods when both heating and cooling may be desired, systems must be capable of heat recovery (simultaneous heating and cooling) operation or rapid changeover. Rapid changeover option allows automatic and alternating mode switching between heating and cooling mode during owner-defined and adjustable ambient temperature ranges. Changeover sequences such as weighted voting—or similar sequences which might result in more than a one-hour delay for the desired heating or cooling during the owner-defined shoulder seasons—are not allowed.

B. Acceptable alternative manufacturers, assuming compliance with these equipment specifications, are Daikin, Panasonic, and Hitachi. Contractor bidding an alternate manufacturer does so with full knowledge that that manufactures product may not be acceptable or approved and that contractor is responsible for all specified items and intents of this document without further compensation.

1.02 SYSTEM DESCRIPTION S-SERIES RAPID CHANGEOVER

A. Per the equipment schedule, the variable capacity, heat pump or heat recovery air conditioning system basis of design is Mitsubishi Electric CITY MULTI VRF (Variable Refrigerant Flow) zoning system(s). In order to maintain optimal tenant comfort during periods when both heating and cooling may be desired, systems must be capable of heat recovery (simultaneous heating and cooling) operation or rapid changeover. Rapid changeover option allows automatic and alternating mode switching between heating and cooling mode during owner-defined and adjustable ambient temperature ranges. Changeover sequences such as weighted voting—or similar sequences which might result in more than a one-hour delay for the desired heating or cooling during the owner-defined shoulder seasons—are not allowed.

B. Acceptable alternative manufacturers, assuming compliance with these equipment specifications, are Daikin, Panasonic, and Hitachi. Contractor bidding an alternate manufacturer does so with full knowledge that that manufactures product may not be acceptable or approved and that contractor is responsible for all specified items and intents of this document without further compensation.

1.03 QUALITY ASSURANCE

A. The units shall be listed by Electrical Testing Laboratories (ETL) and bear the ETL label.

B. All wiring shall be in accordance with the National Electrical Code (N.E.C.).

C. The units shall be manufactured in a facility registered to ISO 9001 and ISO14001 which is a set of standards applying to environmental protection set by the International Standard Organization (ISO).

D. All units must meet or exceed the 2010 Federal minimum efficiency requirements and the ASHRAE 90.1 efficiency requirements for VRF systems. Efficiency shall be published in accordance with the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) Standard 1230.

E. System start-up supervision shall be a required service to be completed by the manufacturer or a duly authorized, competent representative that has been factory trained in system configuration and operation. The representative shall provide proof of manufacturer certification indicating successful completion within no more than two (2) years prior to system installation. This certification shall be included as part of the equipment and/or controls submittals.

1.04 DELIVERY, STORAGE AND HANDLING

A. Unit shall be stored and handled according to the manufacturer's recommendation.

PART 2 - WARRANTY

2.01 WARRANTY

A. The CITY MULTI units shall be covered by the manufacturer's limited warranty for a period of one (1) year parts and seven (7) year compressor to the original owner from date of installation.

B. All manufacturer technical and service manuals must be readily available for download by any local contractor should emergency service be required.

C. Registering and sign-in requirements which may delay emergency service reference are not allowed.

D. The CITY MULTI VRF system shall be installed by a contractor with extensive CITY MULTI install and service training. The mandatory contractor service and install training should be performed by the manufacturer.

PART 3 - OUTDOOR UNITS

3.01 Y-SERIES STANDARD EFFICIENCY RAPID CHANGEOVER (HEAT PUMP), AIR-COOLED OUTDOOR UNITS

A. General:

1. The outdoor unit modules shall be air-cooled, direct expansion (DX), multi-zone units used specifically with VRF components described in this section and Part 5 (Controls). The outdoor unit modules shall be equipped with a single compressor which is inverter-driven and multiple circuit boards—all of which must be manufactured by the branded VRF manufacturer. Each outdoor unit module shall be completely factory assembled, piped and wired and run tested at the factory.
2. Outdoor unit systems may be comprised of multiple modules with differing capacity if a brand other than basis of design is proposed. All units requiring a factory supplied twinning kits shall be piped together in the field, without the need for equalizing line(s). If an alternate manufacturer is selected, any additional material, cost, and labor to install additional lines shall be incurred by the contractor. Contractor responsible for ensuring alternative brand compatibility in terms of availability, physical dimensions, weight, electrical requirements, etc.
3. Outdoor unit shall have a sound rating no higher than 65 dB(A) individually or 70 dB(A) twinned. Units shall have a sound rating no higher than 52 dB(A) individually or 54.5 dB(A) twinned while in night mode operation. Units shall have 5 levels sound adjustment via dip

switch selectable fan speed settings. If an alternate manufacturer is selected, any additional material, cost, and labor to meet published sound levels shall be incurred by the contractor.

4. The outdoor unit shall have the capability of installing the main refrigerant piping through the bottom of the unit.
5. The outdoor unit shall have an accumulator with refrigerant level sensors and controls. Units shall actively control liquid level in the accumulator via Linear Expansion Valves (LEV) from the heat exchanger.
6. The outdoor unit shall have a high pressure safety switch, over-current protection, crankcase heater and DC bus protection.
7. VRF system shall meet performance requirements per schedule and be within piping limitations & acceptable ambient temperature ranges as described in respective manufacturers' published product catalogs. Non-published product capabilities or performance data are not acceptable.
8. The outdoor unit shall be capable of guaranteed operation in heating mode down to -13□F ambient temperatures, simultaneous heating/cooling mode from 14-70□F ambient temperatures, and cooling mode up to 109□F without additional restrictions on line length & vertical separation beyond those published in respective product catalogs. Models with capacity data for required temperature range published as "for reference only" are not considered capable of guaranteed operation and are not acceptable. If an alternate manufacturer is selected, any additional material, cost, and labor to meet ambient operating range and performance shall be incurred by the contractor.
9. The outdoor unit shall have a high efficiency oil separator plus additional logic controls to ensure adequate oil volume in the compressor is maintained. Oil return sequences must be enabled only during extended periods of reduced refrigerant flow to ensure no disruption to correct refrigerant flow to individual zones during peak loads. Systems which might engage oil return sequence based on hours of operation risk oil return during inopportune periods are not allowed. Systems which rely on sensors (which may fail) to engage oil return sequence are not allowed.
10. Unit must defrost all circuits simultaneously in order to resume full heating more quickly during extreme low ambient temperatures (below 23F). Partial defrost, also known as hot gas defrost which allows reduced heating output during defrost, is permissible only when ambient temperature is above 23F.
11. While in hot gas defrost the system shall slow the indoor unit fan speed down to maintain a high discharge air temperature, systems that keep fan running in same state shall not be allowed as they provide an uncomfortable draft to the indoor zone due to lower discharge air temperatures.

B. Unit Cabinet:
   1. The casing(s) shall be fabricated of galvanized steel, bonderized and finished.
   2. The outdoor unit shall be tested in compliance with ISO9277 such that no unusual rust shall develop after 960 hours of salt spray testing.
   3. Panels on the outdoor unit shall be scratch free at system startup. If a scratch occurs and the salt spray protection is compromised, the panel should be replaced immediately.

C. Fan:
   1. Each outdoor unit module shall be furnished with direct drive, variable speed propeller type fan(s) only. Fans shall be factory set for operation at 0 in. wg external static pressure, but capable of normal operation with a maximum of 0.32 in. WG external static pressure via dipswitch.
   2. All fan motors shall have inherent protection, have permanently lubricated bearings, and be completely variable speed.
   3. All fans shall be provided with a raised guard to prevent contact with moving parts.

D. Refrigerant and Refrigerant Piping
   1. R410A refrigerant shall be required for systems.

2. Polyolester (POE) oil—widely available and used in conventional domestic systems—shall be required. Prior to bidding, manufacturers using alternate oil types shall submit material safety data sheets (MSDS) and comparison of hygroscopic properties for alternate oil with list of local suppliers stocking alternate oil for approval at least two weeks prior to bidding.
3. Refrigerant piping shall be phosphorus deoxidized copper (copper and copper alloy seamless pipes) of sufficient radial thickness as defined by the VRF equipment manufacturer and installed in accordance with manufacturer recommendations.
4. All refrigerant piping must be insulated with ½" closed cell, CFC-free foam insulation with flame-Spread Index of less than 25 and a smoke-development Index of less than 50 as tested by ASTM E 84 and CAN / ULC S-102. R value of insulation must be at least 3.
5. Refrigerant line sizing shall be in accordance with manufacturer specifications.

E. Coil:
1. Outdoor Coil shall be constructed to provide equal airflow to all coil face surface are by means of a 4-sided coil.
2. Outdoor Coil shall be elevated at least 12" from the base on the unit to protect coil from freezing and snow build up in cold climates. Manufacturers in which their coil extends to within a few inches from the bottom of their cabinet frame shall provide an additional 12" of height to their stand or support structure to provide equal protection from elements as Mitsubishi Electric basis of design. Any additional support costs, equipment fencing, and tie downs required to meet this additional height shall be responsibility of Mechanical Contractor to provide.
3. The outdoor coil shall be of nonferrous construction with lanced or corrugated plate fins on copper tubing.
4. The coil fins shall have a factory applied corrosion resistant blue-fin finish. Uncoated aluminum coils/fins are not allowed.
5. The coil shall be protected with an integral metal guard.
6. Refrigerant flow from the outdoor unit shall be controlled by means of an inverter driven compressor.
7. Unit shall have prewired plugs for optional panel heaters when operating below ambient conditions of 1F to prevent any residual ice buildup from defrost.
8. Condenser coil shall have active hot gas circuit direct from compressor discharge on lowest coil face area to shed defrost condensate away from coil and protect from Ice formation after returning to standard heat pump operation. While in Heat Pump operation this lower section of the Outdoor Evaporator coil shall continually run hot gas from the compressor discharge to protect the coil from ice buildup and coil rupture. Manufacturers who do not have an active hot gas circuit in the lower section of the Outdoor coil to protect coil from freezing shall not be allowed to bid on project in markets where the outdoor unit will see temperatures below freezing.

F. Compressor:
1. Each compressor shall be equipped with a multi-port discharge mechanism to eliminate over compression at part load. Manufacturer's that rely on a single compressor discharge port and provide no means of eliminating over compression and energy waste at part load shall not be allowed.
2. Each outdoor unit module shall be equipped with only inverter driven scroll hermetic compressors. Non-inverter-driven compressors, which may cause inrush current (demand charges) and require larger generators for temporary power shall not be allowed.
3. Crankcase heat shall be provided via induction-type heater utilizing eddy currents from motor windings. Energy-wasting "belly-band" type crankcase heaters are not allowed. Manufacturers that utilize belly-band crankcase heaters will be considered as alternate only.
4. Compressor shall have an inverter to modulate capacity. The capacity for each compressor shall be variable with a minimum turndown not greater than 15%.
5. The compressor shall be equipped with an internal thermal overload.

6. Field-installed oil equalization lines between modules are not allowed. Prior to bidding, manufacturers requiring equalization must submit oil line sizing calculations specific to each system and module placement for this project.

G. Manufacturers that utilize a compressor sump oil sensor to equalize compressor oil volume within a single module shall not be allowed unless they actively shut down the system to protect from compressor failure.

H. Controls:
1. Outdoor unit shall include Variable Evaporator Temperature or comparable method of varying system evaporator (refrigerant) temperature in order to reduce compression ratio and power consumption during light load or mild ambient temperatures. Multiple evaporator refrigerant temperature settings shall be required in order to optimize efficiency within required system-specific performance and installation constraints. System shall reduce compression ratio only when/if all indoor units are within 1.8F of setpoint; reducing compression ratio based solely on ambient temperature risks discomfort and is not allowed. Variable Evaporator Temperature or comparable method shall incorporate override or disable capability based on external signal to allow for space humidity control or load demand.
2. The unit shall be an integral part of the system & control network described in Part 5 (Controls) and react to heating/cooling demand as communicated from connected indoor units over the control circuit. Required field-installed system controllers, control voltage transformers and/or signal boosters shall be provided by the manufacturer.
3. The outdoor unit shall have the capability of 4 levels of demand control for each refrigerant system based on external input.

I. Electrical:
1. The outdoor unit electrical power shall be 208/230 volts, 3-phase, 60 hertz or 460 volts, 3-phase, 60 hertz per equipment schedule.
2. The outdoor unit shall be controlled by integral microprocessors.
3. The control circuit between the indoor units and the outdoor unit shall be 24VDC completed using a 2-conductor, twisted pair shielded cable to provide total integration of the system.

3.02 S-SERIES RAPID CHANGEOVER HEATING/COOLING (HEAT PUMP), AIR-COOLED OUTDOOR UNITS

A. General:
1. The outdoor unit modules shall be air-cooled, direct expansion (DX), multi-zone units used specifically with VRF components described in this section and Part 5 (Controls). The outdoor unit modules shall be equipped with a single compressor which is inverter-driven and multiple circuit boards—all of which must be manufactured by the branded VRF manufacturer. Each outdoor unit module shall be completely factory assembled, piped and wired and run tested at the factory.
2. Outdoor unit shall have a sound rating no higher than 59 dB(A). If an alternate manufacturer is selected, any additional material, cost, and labor to meet published sound levels shall be incurred by the contractor.
3. Refrigerant lines from the outdoor unit to the indoor units shall be insulated in accordance with the installation manual.
4. The outdoor unit shall have the capability of installing the main refrigerant piping through the bottom of the unit.
5. The outdoor unit shall have an accumulator with refrigerant level sensors and controls.
6. The outdoor unit shall have a high pressure safety switch, over-current protection, crankcase heater and DC bus protection.
7. VRF system shall meet performance requirements per schedule and be within piping limitations & acceptable ambient temperature ranges as described in respective

manufacturers' published product catalogs. Non-published product capabilities or performance data are not acceptable.

8. The outdoor unit shall be capable of guaranteed operation in heating mode down to -13□F ambient temperatures and cooling mode up to 115□F without additional restrictions on line length & vertical separation beyond those published in respective product catalogs. Models with capacity data for required temperature range published as "for reference only" are not considered capable of guaranteed operation and are not acceptable. If an alternate manufacturer is selected, any additional material, cost, and labor to meet ambient operating range and performance shall be incurred by the contractor.
9. The outdoor unit shall have a high efficiency oil separator plus additional logic controls to ensure adequate oil volume in the compressor is maintained. Oil return sequences must be enabled only during extended periods of reduced refrigerant flow to ensure no disruption to correct refrigerant flow to individual zones during peak loads. Systems which might engage oil return sequence based on hours of operation risk oil return during inopportune periods are not allowed. Systems which rely on sensors (which may fail) to engage oil return sequence are not allowed.

B. Unit Cabinet:
   1. The casing(s) shall be fabricated of galvanized steel, bonderized and finished.
   2. Outdoor unit components shall be coated with the Seacoast Protection Coating (Brine Spray – BS coating) to protect components from premature corrosion due to a seacoast environment. Coating shall be applied to components before original outdoor unit assembly to ensure manufacturer quality standards are not compromised and shall meet the following minimum requirements:
      a. ≥85µm thermoset polyester-resin powder coating on External Front Panel
      b. ≥70µm thermoset polyester-resin powder coating on External Panel Base, Pillar, Compressor Cover, Fan Motor Support, Electrical Box
      c. ≥1µm cellulose and polyurethane-resin coating on heat exchanger fins
      d. ≥10µm polyurethane coating on printed circuit boards
   3. The outdoor unit shall be tested in compliance with ISO9277 such that no unusual rust shall develop after 960 hours of salt spray testing.
   4. Panels on the outdoor unit shall be scratch free at system startup. If a scratch occurs the salt spray protection is compromised and the panel should be replaced immediately.

C. Fan:
   1. Each outdoor unit module shall be furnished with direct drive, variable speed propeller type fan(s) only.
   2. All fan motors shall have inherent protection, have permanently lubricated bearings, and be completely variable speed.
   3. All fans shall be provided with a raised guard to prevent contact with moving parts.

D. Refrigerant and Refrigerant Piping
   1. R410A refrigerant shall be required for systems.
   2. Polyolester (POE) oil—widely available and used in conventional domestic systems—shall be required. Prior to bidding, manufacturers using alternate oil types shall submit material safety data sheets (MSDS) and comparison of hygroscopic properties for alternate oil with list of local suppliers stocking alternate oil for approval at least two weeks prior to bidding.
   3. Refrigerant piping shall be phosphorus deoxidized copper (copper and copper alloy seamless pipes) of sufficient radial thickness as defined by the VRF equipment manufacturer and installed in accordance with manufacturer recommendations.
   4. All refrigerant piping must be insulated with ½" closed cell, CFC-free foam insulation with flame-Spread Index of less than 25 and a smoke-development Index of less than 50 as tested by ASTM E 84 and CAN / ULC S-102. R value of insulation must be at least 3.
   5. Refrigerant line sizing shall be in accordance with manufacturer specifications.

E. Coil:

1. The outdoor coil shall be of nonferrous construction with lanced or corrugated fins on copper tubing.
2. The coil fins will have a factory applied corrosion resistant blue-fin finish.
3. The coil shall be protected with an integral metal guard.
4. Refrigerant flow from the outdoor unit shall be controlled by means of an inverter driven compressor.

F. Compressor:
1. Each outdoor unit module shall be equipped with only inverter driven scroll hermetic compressors. Non inverter-driven compressors, which may cause inrush current (demand charges) and require larger generators for temporary power shall not be allowed.
2. Crankcase heat shall be provided via induction-type heater utilizing eddy currents from motor windings. Energy-wasting “belly-band” type crankcase heaters are not allowed.
3. Compressor shall have an inverter to modulate capacity.
4. The compressor shall be equipped with an internal thermal overload.

G. Controls:
1. The unit shall be an integral part of the system & control network described in Part 5 (Controls) and react to heating/cooling demand as communicated from connected indoor units over the control circuit. Required field-installed control voltage transformers and/or signal boosters shall be provided by the manufacturer.

H. Electrical:
1. The outdoor unit electrical power shall be 208/230 volts, 1-phase, 60 hertz per equipment schedule.
2. The outdoor unit shall be controlled by integral microprocessors.
3. The control circuit between the indoor units and the outdoor unit shall be 24VDC completed using a 2-conductor, twisted pair shielded cable to provide total integration of the system.

PART 4 - INDOOR UNITS

4.01 WALL MOUNTED INDOOR UNIT

A. General:
1. The wall-mounted indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, and a test run switch. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.

B. Unit Cabinet:
1. All casings, regardless of model size, shall have the same white finish
2. Multi directional drain and refrigerant piping offering four (4) directions for refrigerant piping and two (2) directions for draining are required.
3. There shall be a separate back plate which secures the unit firmly to the wall.

C. Fan:
1. The indoor fan shall be statically and dynamically balanced to run on a single motor with permanently lubricated bearings.
2. A manual adjustable guide vane shall be provided with the ability to change the airflow from side to side (left to right).
3. A motorized air sweep louver shall provide an automatic change in airflow by directing the air up and down to provide uniform air distribution.

D. Filter:

1. Return air shall be filtered by means of an easily removable, washable filter.

E. Coil:
1. Basis of design indoor units include factory-installed LEV/EEV. Alternative brands which require field-installed, accessory LEV or EEV kits are permissible only with written Engineer and Architect approval for the location of kits being submitted two weeks prior to bid date. EEV kits mounted in cavities inside fire-rated interior walls shall be mounted inside three-hour fire rated enclosures with access panels supplied by the manufacturer. Enclosure type and placement require prior approval.
2. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing. The tubing shall have inner grooves for high efficiency heat exchange. All tube joints shall be brazed with phos-copper or silver alloy.
3. The coils shall be pressure tested at the factory.

F. Electrical:
1. The unit electrical power shall be 208/230 volts, 1-phase, 60 hertz.
2. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz)

G. Controls:
1. The unit shall include an IR receiver for wireless remote-control flexibility
2. Indoor unit shall compensate for the higher temperature sensed by the return air sensor compared to the temperature at level of the occupant when in HEAT mode. Disabling of compensation shall be possible for individual units to accommodate instances when compensation is not required.
3. Control board shall include contacts for control of external heat source. External heat may be energized as second stage with 1.8°F – 9.0°F adjustable deadband from set point.
4. Indoor unit shall include no less than four (4) digital inputs capable of being used for customizable control strategies.
5. Indoor unit shall include no less than three (3) digital outputs capable of being used for customizable control strategies.

4.02 MEDIUM STATIC CEILING-CONCEALED DUCTED INDOOR UNIT

A. General:
1. The ceiling-concealed ducted indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, and an auto restart function. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory. The unit shall be suitable for use in plenums in accordance with UL1995 ed 4.

B. Unit Cabinet:
1. The unit shall be ceiling-concealed, ducted—with a 2-position, field adjustable return and a fixed horizontal discharge supply.
2. The cabinet panel shall have provisions for a field installed filtered outside air intake.

C. Fan:
1. Indoor unit shall feature multiple external static pressure settings ranging from 0.14 to 0.60 in. WG.
2. The indoor unit fan shall be an assembly with statically and dynamically balanced Sirocco fan(s) direct driven by a single motor with permanently lubricated bearings.
3. The indoor fan shall consist of three (3) speeds, High, Mid, and Low plus the Auto-Fan function

D. Filter:

1. Return air shall be filtered by means of a standard factory installed return air filter.
2. Optional return filter box (rear or bottom placement) with high-efficiency filter as noted on equipment schedule.

E. Optional Filter Frame and Filter:
1. Filter frame shall be constructed of 20-gauge G-60 galvanized steel. Knurled thumb screws on access door allow filter replacement. Foam gasket provides air-tight connection to indoor unit and access door. Filter frame shall be configurable for rear or bottom return.
2. Filter shall be rated MERV 13 when tested in accordance with ANSI/ASHRAE 52.2 Standard Rated Class 2 under U.L. Standard 900.

F. Coil:
1. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing. The tubing shall have inner grooves for high efficiency heat exchange. All tube joints shall be brazed with phos-copper or silver alloy.
2. The coils shall be pressure tested at the factory.
3. Coil shall be provided with a sloped drain pan. Units without sloped drain pans which must be installed cockeyed to ensure proper drainage are not allowed.
4. The unit shall be provided with an integral condensate lift mechanism able to raise drain water 27 inches above the condensate pan.

G. Electrical:
1. The unit electrical power shall be 208/230 volts, 1-phase, 60 hertz.
2. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz).

H. Controls:
1. Indoor unit shall compensate for the higher temperature sensed by the return air sensor compared to the temperature at level of the occupant when in HEAT mode. Disabling of compensation shall be possible for individual units to accommodate instances when compensation is not required.
2. Control board shall include contacts for control of external heat source. External heat may be energized as second stage with 1.8°F – 9.0°F adjustable deadband from set point.
3. Indoor unit shall include no less than four (4) digital inputs capable of being used for customizable control strategies.
4. Indoor unit shall include no less than three (3) digital outputs capable of being used for customizable control strategies.

PART 5 - CONTROLS

5.01 OVERVIEW

A. The control system shall consist of a low voltage communication network and a web-based interface. The controls system shall gather data and generate web pages accessible through a conventional web browser on each PC connected to the network. Operators shall be able to perform all normal operator functions through the web browser interface.

B. Furnish energy conservation features such as optimal start, request-based logic, and demand level adjustment of overall system capacity as specified in the sequence.

C. System shall be capable of email generation for remote alarm annunciation.

5.02 ELECTRICAL CHARACTERISTICS

A. General:

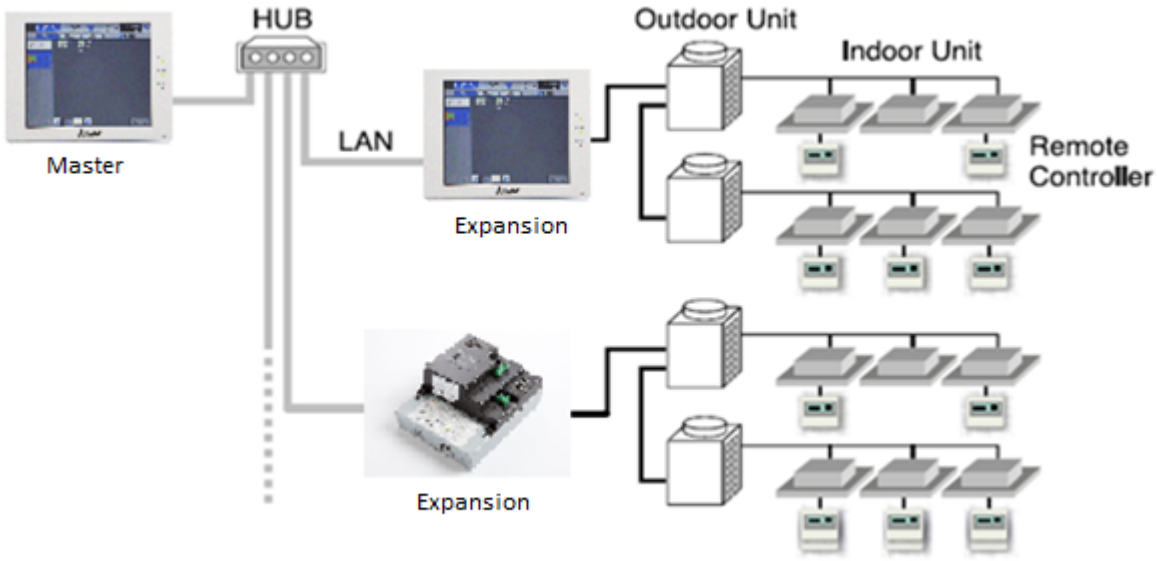
1. Controller power and communications shall be via a common non-polar communications bus and shall operate at 30VDC.

B. Wiring:
   1. Control wiring shall be installed in a daisy chain configuration from indoor unit to indoor unit, to the BC controller (main and subs, if applicable) and to the outdoor unit. Control wiring to remote controllers shall be run from the indoor unit terminal block to the controller associated with that unit.
   2. Control wiring for centralized controllers shall be installed in a daisy chain configuration from outdoor unit to outdoor unit, to the system controllers (centralized controllers and/or integrated web-based interface), to the power supply.

C. Wiring type:
   1. Wiring shall be 2-conductor (16 AWG), twisted, stranded, shielded wire as defined by the Diamond System Builder output.
   2. Network wiring shall be CAT-6 with RJ-45 connection.

5.03 CITY MULTI CONTROLS NETWORK

A. The CITY MULTI Controls Network (CMCN) consists of remote controllers, centralized controllers, and/or integrated web based interface communicating over a high-speed communication bus. The CITY MULTI Controls Network shall support operation monitoring, scheduling, occupancy, error email distribution, personal web browsers, tenant billing, online maintenance support, and integration with Building Management Systems (BMS) using either LonWorks® or BACnet® interfaces. The below figure illustrates a sample CMCN System Configuration.



CMCN System Configuration

5.04 GRAPHICAL USER INTERFACE

A. The Graphical User Interface (Integrated Centralized Control Web) shall require a field supplied PC or Tablet.

B. ICCW:
   1. The Integrated Centralized Control Web System (ICCW) interface shall enable the user to control multiple networked central controllers and shall provide additional functions such as energy apportionment from a single network PC configured with the Charge Calculation Tool. The ICCW shall be capable of controlling up to forty networked Centralized Controllers with a maximum of 2,000 indoor units across multiple CITY MULTI outdoor units. The ICCW shall be required if the user wants to simultaneously control more than 1 Centralized Controllers from a single PC or tablet using a single web browser session. Licensing per function, per Centralized Controller shall be required for the ICCW. Optional software features shall be available through the ICCW including energy apportionment and personalized web. These optional software features shall require the ICCW, advance purchase from the customer, and licensing from ICCW.

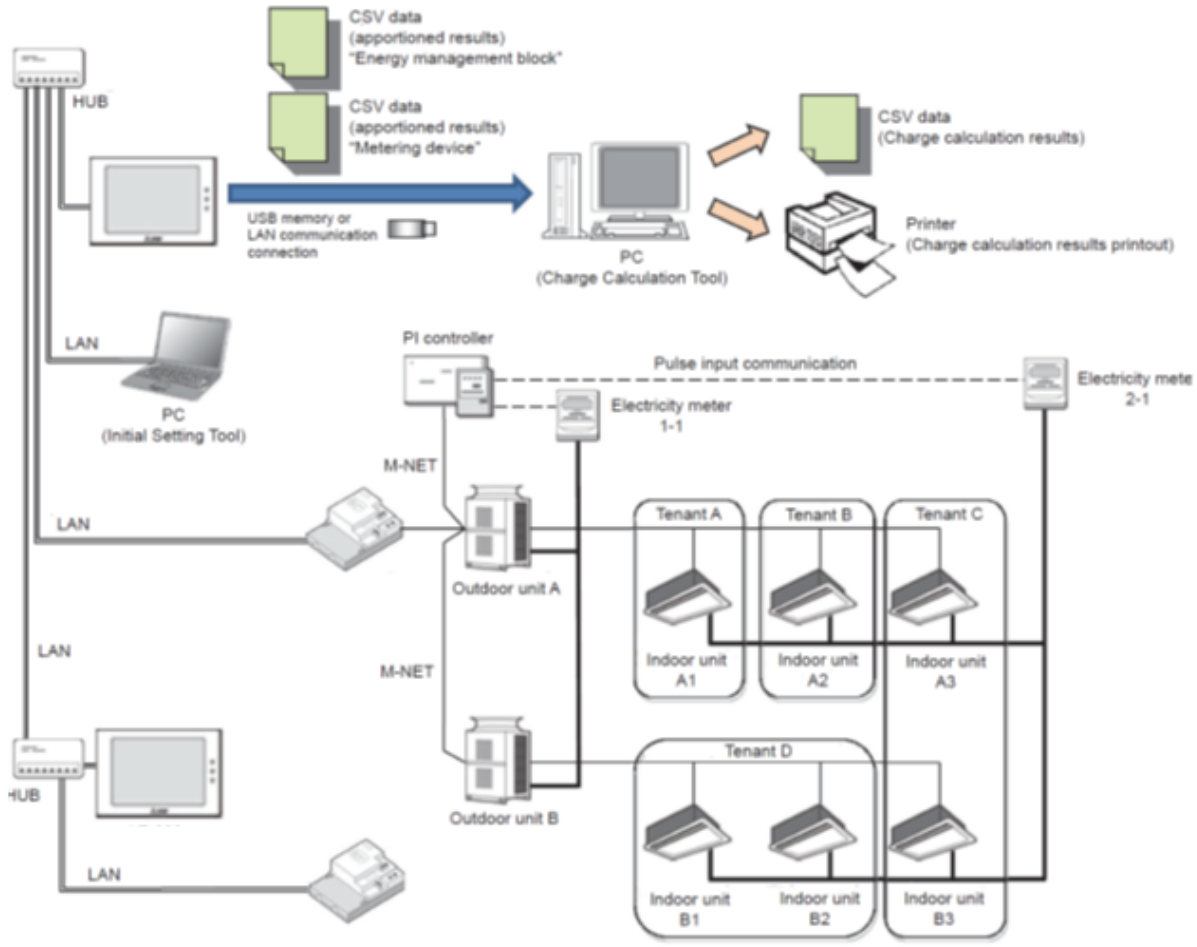
ICCW (Integrated System Software)	
Item	**Details**
ON/OFF	The units can turn ON and OFF for all floors or in a block, floor, or group of units.
Operation Modes	The operation mode can be switched between COOL, DRY, FAN, AUTO, and HEAT for all floors or in a block, floor, or group of units
Temperature Setting	Sets the temperature for a single group. Range of Temperature setting from 57°F – 87°F depending on operation mode and indoor unit model. Separate COOL and HEAT mode set points available depending on remote controller and connected mechanical equipment.
Fan Speed	The fan speed can be set to four stages for all floors or in a block, floor, or group of units
Air Direction	The air direction can be set in four vertical directions or to swing for all floors or in block, floor, or group of units. (The selectable air direction differs according to the model.)
Interlocked Unit ON/OFF LOSSNAY	If there is an interlocked unit (LOSSNAY), then the unit can be turned ON (strong/weak) or OFF for all floors or in a block, floor, or group of units. (Note that the ventilation mode cannot be selected for interlocked units.)
Local Operation Prohibit	The items for which operation with the local remote controller are to be prohibited can be selected for all floors or in a block, floor, or group of units. (The items that can be prohibited are ON/OFF, operation mode, set temperature and filter sign reset.)
Annual / Weekly Schedule	The annual/weekly schedule function can be used by registering the license. Two settings, such as seasonal settings for summer and winter, can be saved.
Power Rate Apportionment Charging	A watt-hour meter (WHM) with kWH pulse output is connected to calculate the air conditioning charges based on the amount each tenant’s air-conditioner has operated. Five charging rates can be applied per day. ***OPTIONAL ENERGY APPORTIONMENT SOFTWARE (LIC-CHARGE) and PI Controller (PAC-Y60MCA) REQUIRED

History	Up to 3,000 items for the error history and up to 10,000 items for operation history can be saved. Each history file can be output as a daily report or monthly report in CSV format. (The operation history consists only of the operations carried out with the ICCW and is limited to some limited operation items.)
Operation Time Monitor	The cumulative operation time of each indoor unit can be viewed or output as a CSV format file. (This function is valid only when the charging function license is registered.)
Filter Sign Display Mask	The filter sign display at the remote controllers can be disabled.
Set Temperature Limit	The set temperature lower limit can be set for cooling and the upper limit for heating. (ME remote controller required)

5.05 CMCN: SYSTEM INTEGRATION

A. The CMCN shall be capable of supporting integration with Building Management Systems (BMS) via industry standard communication protocols including BACnet and LonWorks®.

5.06 ENERGY APPOINTMENT METHOD FOR CITY MULTI CENTRALIZED CONTROLLERS



5.06 CMCN System Configuration

A. System Overview:
   1. For centralized systems serving multiple tenants for which one-to-one electricity metering is not possible, an apportioned electricity billing function that attributes just the electrical energy consumed by each individual tenant's air conditioner is required. The Energy Apportionment function takes the information on the electrical energy usage gathered from Watt Hour Meters (WHM) connected to dedicated breaker panels serving the system's outdoor units and synthesizes it with the information on the operating status of the indoor units that is collected by the CITY MULTI centralized controller(s).

B. Watt Hour Meters:
   1. Requirements:
      a. The Watt Hour Meters (WHMs) to be used to read the electrical energy consumption of the outdoor units must be capable of a pulse output, which would be configured based on the current rating of the units. The associated current transformers/ transducers (CTs) must also be sized based on the current rating of either the individual outdoor units or the dedicated air conditioning electrical panels they are to be reading. The proper quantity of meters for a particular sized system must be selected in order to ensure sufficient resolution and hysteresis in the unit pulse

output of the meters so as to ascribe an acceptable level of accuracy to the apportionment of energy usage for each tenant's system. The system is designed to work with any WHM capable of a pulse output that meets ANSI C12.20 class 0.2% or 0.5% accuracy standards.

2. Connection:
   a. The WHMs are to be physically connected to the integrated pulse input module or an external Mitsubishi Electric PI Controller if such an input is not available or if there is a wiring length limitation or installation hardship. The cable type of the interconnecting wiring shall be according to the wiring specifications of the WHM manufacturer.

C. CITY MULTI Centralized Controller Requirements
   1. Licensing:
      a. Each centralized controller to which units are assigned that require the energy apportionment function must have the "LIC-Charge" software license purchased and properly unlocked in order to enable the operating status of the indoor units to be passed to the energy apportionment tool. The procedure for licensing the centralized controllers with this function and the necessary forms can be found on Mitsubishi Electric's technical documentation repository, mylinkdrive.com. Purchase Order information for the licenses will be required at the time of submission of the licensing request forms.
   2. Dedicated master centralized controller for apportionment (no MNET connection)
      a. A dedicated master centralized controller, for which the LIC-Charge license is purchased and the energy apportionment function enabled, must be provided in order to serve as the portal for exporting metering device and energy management data to a USB drive or to a PC via LAN connection. This means that by virtue of selecting this master centralized controller to serve this function, the MNET capability of this particular centralized controller will be disabled. All indoor units must be physically wired via MNET to other expansion centralized controllers, which must be physically wired via LAN with Static IP addresses and a network hub or switch to the master apportionment controller.
   3. PC for collecting charge calculation results
      a. A networked PC, which does not necessarily have to be dedicated to the task of collecting energy apportionment data, can be provided and loaded with the Charge Calculation Tool software for exporting data necessary to generate billing documentation to be performed by a third party. The system requirements of the PC are as follows:

Item	**Requirements**
CPU	1 GHz or better (at least 2 GHz recommended)
Memory	2GB or more
Screen Resolution	1024 x 768 or better
OS	Windows 7, Windows 8.1 (32bit/64bit)
System requirements	The system should meet the minimum requirement for Windows 7 or Windows 8.1 or Windows 10 • Net Framework 4.5 or later
Internal LAN port or LAN card	100 BASE-TX or better

Porting device	Mouse, etc.

5.07 CMCN: REMOTE CONTROLLERS

A. Touch MA Remote Controller
   1. The Backlit Touch MA Remote Controller shall be capable of controlling up to 16 indoor units (defined as 1 group).
   2. The Backlit Touch MA Remote Controller shall only be the only controller in the group.

Touch MA Remote Controller:			
Item	**Description**	**Operation**	**Display**
ON/OFF	Run and stop operation for a single group	Each Group	Each Group
Operation Mode	Switches between Cool/Drying/Auto/Fan/Heat/Setback. Operation modes vary depending on the air conditioner unit. Auto and Setback mode are available for the R2/WR2-Series only.	Each Group	Each Group
Temperature Setting	Sets the temperature from 32°F – 104°F depending on operation mode and indoor unit. Separate COOL and HEAT mode set points available depending on central controller and connected mechanical equipment	Each Group	Each Group
Fan Speed Setting	Available fan speed settings depending on indoor unit	Each Group	Each Group
Air Flow Direction Setting	Air flow direction settings vary depending on the indoor unit model.	Each Group	Each Group
Permit / Prohibit Local Operation	Individually prohibit operation of each local remote control function (Start/Stop, Change operation mode, Set temperature, Reset filter). *1: Centrally Controlled is displayed on the remote controller for prohibited functions.	N/A	Each Group *1
Display Indoor Unit Intake Temp	Measures and displays the intake temperature of the indoor unit when the indoor unit is operating.	N/A	Each Group
Display Backlight	Pressing the screen lights up a backlight. The light automatically turns off after a certain period of time. (The brightness settings can be selected from Bright, Dark, and Light off.)	N/A	Each Unit
Error	When an error is currently occurring on an air conditioner unit, the afflicted unit and the error code are displayed	N/A	Each Unit

Test Run	Operates air conditioner units in test run mode. *2 The display for test run mode will be the same as for normal start/stop (does not display “test run”).	Each Group	Each Group *2
Ventilation Equipment	Up to 16 indoor units can be connected to an interlocked system that has one LOSSNAY unit.	Each Group	N/A
Set Temperature Range Limit	Set temperature range limit for cooling, heating, or auto mode.	Each Group	Each Group
Display Color Change	Controller can allow for the user to change the color of the text and/or background.	Each Controller	N/A

5.08 CENTRALIZED CONTROLLER (WEB-ENABLED)

A. Master Centralized Controller:
   1. The Master Centralized Controller shall be capable of controlling a maximum of two hundred (200) indoor units across multiple CITY MULTI outdoor units with the use of three expansion controllers. The Master Centralized Controller shall be approximately 11-5/32” x 7-55/64” x 2-17/32” in size and shall be powered with an integrated 100-240 VAC power supply. The Master Centralized Controller shall support system configuration, daily/weekly scheduling, monitoring of operation status, night setback settings, free contact interlock configuration and malfunction monitoring. When being used alone without the expansion controllers, the Master Centralized Controller shall have five basic operation controls which can be applied to an individual indoor unit, a collection of indoor units (up to 50 indoor units), or all indoor units (collective batch operation). This basic set of operation controls for the Master Centralized Controller shall include on/off, operation mode selection (cool, heat, auto (R2/WR2-Series only), dry, setback (R2/WR2-Series only) and fan), temperature setting, fan speed setting, and airflow direction setting. Since the master provides centralized control it shall be able to enable or disable operation of local remote controllers. In terms of scheduling, the Master Centralized Controller shall allow the user to define both daily and weekly schedules (up to 24 scheduled events per day) with operations consisting of ON/OFF, mode selection, temperature setting, air flow (vane) direction, fan speed, and permit/prohibit of remote controllers.

Master Centralized Controller			
Item	**Description**	**Operation**	**Display**
ON/OFF	Run and stop operation.	Each Block, Group or Collective	Each Group or Collective
Operation Mode	Switches between Cool/Dry/Auto/Fan/Heat. (Group of Lossnay unit: automatic ventilation/vent-heat/interchange/normal ventilation) Operation modes vary depending on the air conditioner unit.	Each Block, Group or Collective	Each Group

	Auto mode is available for the R2/WR2-Series only.		
Temperature Setting	Sets the temperature from 57°F – 87°F depending on operation mode and indoor unit.	Each Block, Group or Collective	Each Group
Fan Speed Setting	Available fan speed settings depending on indoor unit.	Each Block, Group or Collective	Each Group
Air Flow Direction Setting	Air flow direction settings vary depending on the indoor unit model. *1. Louver cannot be set.	*1 Each Block, Group or Collective	Each Group
Schedule Operation	Annual/weekly/today schedule can be set for each group of air conditioning units. Optimized start setting is also available. *2. The system follows either the current day, annual schedule, or weekly, which are in the descending order of overriding priority. Twenty-four events can scheduled per day, including ON/OFF, Mode, Temperature Setting, Air Direction, Fan Speed and Operation Prohibition. Five types of weekly schedule (seasonal) can be set. Settable items depend on the functions that a given air conditioning unit supports.	*2 Each Block, Group or Collective	Each Group
Optimized Start	Unit starts 5 - 60 minutes before the scheduled time based on the operation data history in order to reach the scheduled temperature at the scheduled time.	Each Block, Group or Collective	Each Group
Night Setback Setting	The function helps keep the indoor temperature in the temperature range while the units are stopped and during the time this function is effective.	Each Group	Each Group
Master Centralized Controller			
Item	**Description**	**Operation**	**Display**
Permit / Prohibit Local Operation	Individually prohibit operation of each local remote control function (Start/Stop, Change operation mode, Set temperature, Reset filter). *3. Centrally Controlled is displayed on the remote controller for prohibited functions.	Each Block, Group or Collective	*3 Each Group
Room Temp	Displays the room temperature of the group. Space temperature displayed on the indoor unit icon on the touch screen interface.	N/A	Each Group

Error	When an error is currently occurring on an air conditioner unit, the afflicted unit and the error code are displayed *4. When an error occurs, the LED flashes. The operation monitor screen shows the abnormal unit by flashing it. The error monitor screen shows the abnormal unit address, error code and source of detection. The error log monitor screen shows the time and date, the abnormal unit address, error code and source of detection	N/A	*4 Each Unit or Collective
Outdoor Unit Status	Compressor capacity percentage and system pressure (high and low) pressure (excludes S-Series)	Each ODU	Each ODU
Connected Unit Information	MNET addresses of all connected systems	Each IDU, ODU and BC	Each IDU, ODU and BC
Ventilation Equipment	This interlocked system settings can be performed by the master system controller. When setting the interlocked system, use the ventilation switch the free plan LOSSNAY settings between “Hi”, “Low” and “Stop”. When setting a group of only free plan LOSSNAY units, you can switch between “Normal ventilation”, “Interchange ventilation” and “Automatic ventilation”.	Each Group	Each Group
Multiple Language	Other than English, the following language can be chosen. Spanish, French, Japanese, Dutch, Italian, Russian, Chinese, and Portuguese are available.	N/A	Collective
External Input / Output	By using accessory cables you can set and monitor the following. Input By level: “Batch start/stop”, “Batch emergency stop” By pulse: “batch start/stop”, “Enable/disable remote controller” Output: “start/stop”, “error/Normal” *5. Requires the external I/O cables (PAC-YG10HA- E) sold separately.	*5 Collective	*5 Collective

2. All Master Centralized Controllers shall be equipped with two RJ-45 Ethernet ports to support interconnection with a network PC via a closed/direct Local Area Network (LAN) or to a network switch for IP communication to up to three expansion controllers for display of up to two hundred (200) indoor units on the main master centralized controller interface.

3. The Master Centralized Controller shall be capable of performing initial settings via the high-resolution, backlit, color touch panel on the controller or via a PC browser using the initial settings.
4. Standard software functions shall be available so that the building manager can securely log into each master centralized controller via the PC's web browser to support operation monitoring, scheduling, error email, interlocking and online maintenance diagnostics. Additional optional software functions of personal browser for PCs and MACs and Energy shall be available but are not included. The Energy Apportionment function shall require a LIC-Charge software license

B. Expansion Controller:
1. The Expansion Controller shall serve as a standalone centralized controller or as an expansion module to the Master Centralized Controller for the purpose of adding up to 50 indoor units to either the main touch screen interface of the master centralized controller. Up to three (3) expansion controllers can be connected to the master via a local IP network (and their IP addresses assigned on the master) to the master to allow for up to two hundred (200) indoor units to be monitored and controlled from the master interface.
2. The expansion controllers have all of the same capabilities to monitor and control their associated indoor units as the features specified above. Even when connected to the master and configured to display their units on the main controller, the individual indoor units connected to the expansion can still be monitored and controlled from the interface of the expansion. The last command entered will take precedence, whether at the wall controller, the expansion or the master Centralized Controller.

C. Non-Touch Screen, Networked Centralized Controller:
1. The Non-Touch Screen, Networked Centralized Controller shall be capable of controlling a maximum of 50 indoor units across multiple CITY MULTI outdoor units. The controller shall be approximately 8-1/2"x10" in size and shall be powered by its internal power supply. The controller shall support system configuration, daily/weekly scheduling, monitoring of operation status, free contact interlock configuration and malfunction monitoring. The controller shall have five basic operation controls which can be applied to an individual indoor unit, a group of indoor units (up to 50 indoor units), or all indoor units (collective batch operation). This basic set of operation controls for the controller shall include on/off, operation mode selection (cool, heat, auto (R2/WR2-Series only), dry, temperature setting, fan speed setting, and airflow direction setting. Since the controller provides centralized control, it shall be able to enable or disable operation of local remote controllers. In terms of scheduling, the controller shall allow the user to define both daily and weekly schedules with operations consisting of ON/OFF, mode selection, temperature setting, air flow (vane) direction, fan speed, and permit/prohibit of remote controllers.

Non-Touch Screen, Network Centralized Controller			
Item	**Description**	**Operation**	**Display**
ON/OFF	Run and stop operation.	Each Block, Group or Collective	Each Group or Collective
Operation Mode	Indoor unit modes: COOL/DRY/FAN/AUTO/HEAT. Lossnay unit modes: HEAT RECOVERY/BYPASS/AUTO Air to water (PWFY) modes:	Each Block, Group or Collective	Each Group

	HEATING/HEATING ECO/HOT WATER/ANTI-FREEZE/COOLING *Operation modes vary depending on the unit model connected. ** Auto mode is available for the R2/WR2-Series only.		
Temperature Setting	Sets the temperature from 40°F – 95°F depending on operation mode and indoor unit model. Separate COOL and HEAT mode set points available depending on remote controller and connected mechanical equipment.	Each Block, Group or Collective	Each Group
Set Temperature Range Limit	The range of room temperature setting can be limited by the initial setting depending on the indoor unit connected.	Each Group	Each Group
Fan Speed Setting	Available fan speed settings depending on indoor unit.	Each Block, Group or Collective	Each Group
Air Flow Direction Setting	Air flow direction settings vary depending on the indoor unit model. *1. Louver cannot be set.	*1 Each Block, Group or Collective	Each Group
Schedule Operation	Annual/weekly/today schedule can be set for each group of air conditioning units. Optimized start setting is also available. *2. The system follows either the current day, annual schedule, or weekly, which are in the descending order of overriding priority. Twenty-four events can scheduled per day, including ON/OFF, Mode, Temperature Setting, Air Direction, Fan Speed and Operation Prohibition. Five types of weekly schedule (seasonal) can be set. Settable items depend on the functions that a given air conditioning unit supports.	*2 Each Block, Group or Collective	Each Group
Non-Touch Screen, Network Centralized Controller			
Item	**Description**	**Operation**	**Display**
Hold	Disables scheduled functions for indoor unit groups and their associated remote controller timers.	Each Block, Group or Collective	Each Group

	*not available for general equipment		
Optimized Start	Unit starts 5 - 60 minutes before the scheduled time based on the operation data history in order to reach the scheduled temperature at the scheduled time.	Each Block, Group or Collective	Each Block, Group or Collective
Permit / Prohibit Local Operation	Individually prohibit operation of each local remote control function (Start/Stop, Change operation mode, Set temperature, Fan Speed, Air Direction and Reset filter). *3. Centrally Controlled is displayed on the remote controller for prohibited functions.	Each Block, Group or Collective	*3 Each Group
Room Temp	Displays the room temperature of the group.	N/A	Each Group
Room Humidity	Displays the percent relative humidity in the space as sensed by the Smart ME Remote Controller	N/A	Each Group
Occupancy Sensor	Displays the occupancy icon on the group icon in the condition list page when the room is occupied (blue) or vacant (gray). *The Smart ME Remote Controller Occupancy sensor is required.	N/A	Each Group
Brightness Sensor	Displays the brightness icon on the group icon in the condition list when the space is determined to be bright (yellow) or dark (gray). *The Smart ME Remote Controller Brightness sensor is required.	N/A	Each Group
Error	When an error is currently occurring on an air conditioner unit, the afflicted unit and the error code are displayed *4. When an error occurs, the LED flashes. The operation monitor screen shows the abnormal unit by flashing it. The error monitor screen shows the abnormal unit address, error code and source of detection. The error log monitor screen shows the time and date, the abnormal unit address, error code and source of detection	N/A	*4 Each Unit or Collective
Non-Touch Screen, Network Centralized Controller			
Item	**Description**	**Operation**	**Display**
Ventilation Equipment	This interlocked system settings can be performed by the master system controller.	Each Group	Each Group

	When setting the interlocked system, use the ventilation switch the free plan LOSSNAY settings between “Hi”, “Low” and “Stop”. When setting a group of only free plan LOSSNAY units, you can switch between “Normal ventilation”, “Interchange ventilation” and “Automatic ventilation”.		
Multiple Language	Other than English, the following language can be chosen. Spanish, French, Japanese, German, Italian, Russian, Chinese, and Portuguese are available.	N/A	N/A
External Input / Output	By using accessory cables you can set and monitor the following. Input: By level: “Batch start/stop”, “Batch emergency stop”; By pulse: “batch start/stop”, “Enable/disable remote controller” Output: “start/stop”, “error/Normal” *5. Requires the external I/O cables (PAC-YG10HA-E) sold separately.	*5 Collective	*5 Collective
M-Net	The "M-NET" LED lights, when AC power supply is turned ON. The LED blinks while M-NET is communicating.	N/A	Each Group (LED)
Collective ON/OFF	All the units can be operated / stopped with a DIP switch.	Collective	N/A
Measurement	Displays the Temperature and Humidity inputs of the AI Board. Supports graph display and data export.	N/A	Each Unit
AHC Status	Displays the status of the of the inputs and outputs of each Advanced HVAC Controller (DC-A2IO)	N/A	Each Unit
Free Contact Status	Displays the input/output status of the Free Contacts on the indoor units	N/A	Each Unit
Free Contact Interlock	Control Operation of indoor groups, general equipment or free contact outputs based on group(s) conditions or free contact(s) input states.	Each Group, Output or Collective	N/A
Data Back-up (PC)	Initial setting data can be exported to a PC.	Collective	N/A

2. All Non Touch Screen, Networked Centralized Controller shall be equipped with two RJ-45 Ethernet port to support interconnection with a network PC and BACnet/IP communication via a closed/direct Local Area Network (LAN). The controller shall be capable of performing

initial settings online via a PC using the controller's initial setting browser or online/offline with the Initial Setting Tool.

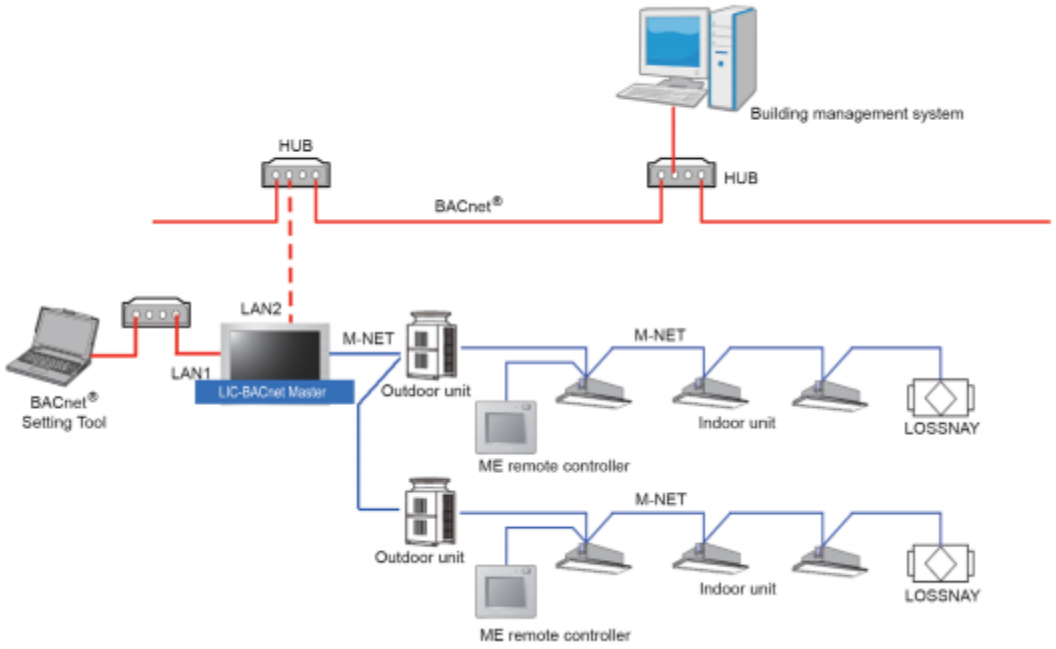
3. Standard software functions shall be available so that the building manager can securely log into each controller via the PC's web browser to support operation monitoring, scheduling, error email, interlocking and online maintenance diagnostics. Standard software functions shall not expire. Additional optional software functions of personal browser for PCs and MACs and Energy Allocation shall be available. The Energy Allocation function shall require Master Centralized Controller Energy Allocation Integrated System in conjunction with Non-Touch Screen, Networked Centralized Controller.

5.09 CMCN REMOTE CONTROLLERS: SYSTEM INTEGRATION

A. The CMCN shall be capable of supporting integration with Building Management Systems (BMS).

B. BACnet® Integration:

1. The Mitsubishi Electric Cooling & Heating BACnet® hardware, which is built into all networked central controllers, shall be compliant with BACnet® Protocol (ANSI/ASHRAE 135-2010) and be Certified by the (BTL) BACnet® Testing Laboratories. The BACnet® interface shall support BACnet Broadcast Management (BBMD). The BACnet® interface shall support a maximum of 50 indoor units. Operation and monitoring points include, but are not limited to, on/off, operation mode, fan speed, prohibit remote controller, filter sign reset, alarm state, error code, and error address.
2. Licenses:
   a. LIC-BACnet Master: Master Controller license for Master Centralized Controller and Non-Touch Screen, Networked Centralized Controller
   b. LIC-BACnet Expansion: Expansion Controller license for Expansion Controller and Non-Touch Screen, Networked Centralized Controller
3. LIC-BACnet Specifications:
   a. Control up to 50 groups
   b. 1 to 16 indoor units can be collectively controlled in a group
   c. Supports dual set point functionality (connected model dependant)
   d. BTL Compliant
   e. BACnet communication specifications are based on ANSI/ASHRAE Standards 135-2010
4. PC Requirements:
   a. CPU: 1GHz or higher
   b. Memory: 1GB or more
   c. HDD Space: 100 MB or more
   d. Screen Resolution: 1024 x 768 or higher
   e. OS: Microsoft Windows 7 32-bit/64-bit, Microsoft 8.1 32-bit/64-bit. Not compatible with Windows Vista
   f. Execution Environment: Microsoft .NET Framework 4.5 or later
   g. Others: Pointing device such as a mouse, internet connection (required when installing a .NET Framework)
5. LIC-BACnet – System Example



6. BACnet Point List
   a. Object List
   b. On Off Setup
   c. On Off State, Number of ON/OFF, Cumulative operation time
   d. Alarm Signal (4-digit error code)
   e. Error Code
   f. Operational Mode Setup
   g. Operational Mode State
   h. Fan Speed Setup
   i. Fan Speed State
   j. Room Temp [Water Temp]
   k. Set Temp [Set Water Temp]
   l. Set Temp Cool
   m. Set Temp Heat
   n. Set Temp Auto
   o. Filter Sign [Circulating Water Exchange Sign]
   p. Filter Sign Reset [Circulating Water Exchange Sign Reset]
   q. Prohibition On Off
   r. Prohibition Mode
   s. Prohibition Filter Sign Reset [Prohibition Circulating Water Exchange Sign Reset]
   t. Prohibition Set Temperature
   u. M-NET Communication State
   v. System Forced Off
   w. Air Direction Setup
   x. Air Direction State
   y. Set High Limit Setback Temp
   z. Set Low Limit Setback Temp
   aa, Ventilation Mode Setup
   bb. Ventilation Mode State
   cc. Air To Water Mode Setup
   dd. System Alarm Signal (4-digit error code)
   ee. PI Controller Alarm Signal (4-digit error code)
   ff. Group Apportioned Electric Energy
   gg. Interlocked Units Apportioned Electric Energy

hh. PI controller Electric Energy 1–4
ii. Pulse Input Electric Energy 1–4
jj. Group Apportionment Parameter
kk. Interlocked Units Apportionment Parameter
ll. Night Purge State
mm. Thermo On Off State
nn. Trend Log Room Temp
oo. Trend Log Group Apportioned Electric Energy
pp. Trend Log Interlocked Units Apportioned Electric Energy
qq. Trend Log PI controller Electric Energy 1–4
rr. Trend Log Pulse Input Electric Energy 1–4
ss. Trend Log Group Apportionment Parameter
tt. Trend Log Interlocked Units Apportionment Parameter

SEQUENCE OF OPERATION:

VRV Recirculation Fan Coils

Schedule Function SOO

- Schedule VRF Fan Coils on during business hours. Business Hours as specified by End User with start time adjusted to allow for 60 minutes warmup operation and ventilation air purge.
- Schedule VRF Fan Coils Off at the conclusion of Business. Override Timer function to be enabled for After Hours operation. Override Timer will be set at 120 Minutes.

Setpoint Functions SOO

- Occupied Setpoints will be 75 degrees (Cooling), 68 degrees (Heating) with Setpoint Tracking Function Enabled. Occupant will have +/- 2 Degree Local Adjustment of the Setpoint Temperatures.

Setback Function SOO

- Unoccupied Setpoints will be 80 Cool, 64 Heat. VRF Fan Coil will turn on at Setback/Setup Temperatures and Recover Zone Temperature 4 Degrees with a Minimum of 30 Minute Runtime. Control system will poll room temperatures every 5 minutes.

Operation Mode Changeover SOO

- Mode of Operation will automatically switch from Cooling to Heating and vice versa at the Occupied Setpoints with a 1 Degree Primary Deadband and 15 Minute Guard Timer OR Additional 1 Degree Secondary Deadband, whichever occurs first. Control system will poll room temperatures every 5 minutes.

VRF Refrigeration Circuit and Blowers (These SOOs are provided for background information on the VRF system, further more detailed information is available to trained technicians in the VRF service manuals)

Compressor SOO

- Compressors will detect a Call for cooling or heating on their refrigeration circuit and automatically enable with a soft start.
- Compressor Speed will module to maintain Target Refrigeration Temperatures for Cooling and

Heat Pump Operation. The Refrigeration Targets will automatically reset based on outdoor ambient temperature for energy savings.
- Compressors will speed up at set intervals for oil return.
- Compressors will pump down the refrigeration circuit when all cooling and heating calls are satisfied and turn off automatically. When off, the crankcase heaters will be energized.

Fan Coil Expansion Valve SOO

- Fan Coil Expansion valve will initiate a Call for cooling or heating 1 Degree out of the respective setpoint.
- The Expansion valve will open and modulate to maintain 9 Degrees of Superheat based on the DX Coil Liquid and Gas Thermistors during cooling operation.
- The Expansion valve will open and modulate to maintain 9 Degrees of Subcooling based on the DX Coil Liquid Thermistor and Refrigeration Circuit Condensing Temperature during heating operation.
- Fan Coil Expansion valve will satisfy a Call for cooling or heating 1 Degree past the respective setpoint and close or go to minimum position.

Fan Coil Blower SOO

- VRf Recirculation Fan Coil Blower will operate at the User Fan Speed during occupied hours.
- Recirculation Fan Coil Blowers will always maintain the User Fan Speed during cooling mode operation.

- Recirculation Fan Coil Blowers will turn off to warmup the DX Coil upon a Heating call, once the DX Coil thermistors detect a hot DX coil, blower operation will resume and fan RPM will gradually increase to the User Fan Speed while trying to maintain the hot DX Coil temperature. In the heating mode dead band, the Blower RPM will be reduced to a minimum speed to reduce drafts.

Branch Selector Box SOO

- VRF Branch Selector Box Suction valves and Discharge valves will automatically Open or Close to allow Cooling and Heat Pump operation on the respective Branch lines based on the respective Fan Coil's mode of operation.
- The respective Fan Coil's Expansion Valve will automatically close during Mode changeover. The Branch Selector valves will open or close gradually to allow for pressure equalization to occur before the Fan Coil valve is reopened.
- When all Circuit Fan Coils are in Cooling operation, all Branch Selector Suction and Discharge valves will open to allow oil return to the compressor.
- VRF Branch Selector Box Subcooling valves will automatically meter a small portion of liquid refrigerant for Heating Branches during Heat Recovery parallel operation. This will allow the remaining liquid refrigerant to be subcooled before flowing to the Main liquid line. The metered refrigerant vapor will be superheated and routed to the Main suction line.

END OF SECTION

This page intentionally left blank

SECTION 26 01 00
GENERAL REQUIREMENTS OF ELECTRICAL WORK

PART 1 GENERAL

1.01 SUMMARY

A. This Section describes the general requirements for the electric work. These requirements apply to all sections of Division 26.

B. Provide electrical materials, equipment, services, rentals, labor and testing to complete the installation and testing of the electrical work specified in the Construction Documents.

C. Power receptacles and data outlet locations shall be approved by the Owner prior to wall close in.

1.02 GENERAL REQUIREMENTS

A. No exposed conduit or surface raceway, except in Mechanical yard or equipment rooms, shall be permitted without written approval from the Owner.

B. Multi-wire branch circuits shall not be permitted. Provide a dedicated neutral for all branch circuits requiring a neutral.

C. T-24: Provide all applicable requirements for T-24, parts 1 and 6 compliance including but not limited to providing acceptance testing, data registry, applicable form submittals, installation. This includes providing certified test technicians. All lighting control devices and systems, ballasts, and luminaires shall comply with the California Energy Code

D. Provide complete testing of all equipment and systems affected by the electrical work. A complete functional acceptance test shall be prepared and performed on all electrical systems and equipment to prove they perform as intended under all modes of operation. Contractor is responsible for preparing and conducting acceptance test procedures in accordance with this specification. Also the testing will demonstrate the electrical system and equipment operation to the Owner. All labor, services, rentals, materials and testing equipment which is required shall be provided.

E. Provide a UL label or evidence of UL listing for all electrical material, unless the material is of a type for which a label or listing service is not provided.

1.03 CODE COMPLIANCE

A. Perform all work in accordance with following codes The latest edition or supplement or amendment thereto in effect at the time of submittal of bid shall be considered to be the issue in effect (unless shown otherwise) of all applicable laws, codes, and regulations including, but not limited to:
   1. California Electrical Code (CEC)
   2. California Building Code (CBC)
   3. California Fire Code (CFC)
   4. California Mechanical Code (CMC)
   5. California Plumbing Code (CPC)
   6. California Building Standards Administrative Code (CCR)
   7. California Green Building Standards Code
   8. California Energy Code
   9. All Applicable State and Local Codes and Regulations

B. Where codes or standard specifications other than those listed in this paragraph are referred to in the different Divisions of these specifications, it is understood that they apply as fully as if cited here.

C. Where differences exist between codes affecting this work, the code affording the greatest protection to the Owner shall govern.

D. If the Contractor observes that these drawings and specifications are at variance with the codes, the Contractor shall notify the Project Manager in writing at once for resolution.

1.04 PERMITS, FEES AND INSPECTIONS

A. Call for all local building department inspections.

B. Obtain approvals from local building inspector prior to final observation by Owner.

A. Comply with the current applicable standards of the listed agencies for electrical materials and installation.

B. Underwriters Laboratories, Inc. (UL): Provide a UL label or evidence of UL listing for all electrical material, unless the material is of a type for which a label or listing service is not provided.

C. National Electrical Manufacturer's Association (NEMA).

D. American National Standards Institute (ANSI).

E. American Society for Testing Materials (ASTM).

F. Insulated Power Cable Engineers Association.

G. Certified Ballast Manufacturer's Association.

H. Institute of Electrical and Electronic Engineers (IEEE).

1.06 SUBMITTALS

A. Provide submittals for items specified in individual sections of Division 26.

B. Provide submittals for items listed documenting compliance with specification requirements.
   1. Materials and Services
   2. Contractor prepared Tests and Commissioning Plans for Architect review and approval.
   3. Tests and Commissioning Results
   4. Shop drawings
   5. Operation and Maintenance Manual.
   6. Record Drawings.
   7. Other- Submittals required elsewhere in the Construction Documents.

1.07 MATERIALS

A. Provide new material of the quality specified and satisfactory to the Owner.
   1. Provide major equipment which is the product of a manufacturer who has, for a period of not less than five years been in successful manufacture of similar equipment to that specified and who has a catalog covering ratings and specifications of proposed equipment.

1.08 SUBSTITUTIONS

A. The first product, material, or equipment specified by brand or trade name and model number is the basis for the Project design and the use of any item other than the first named one may require modifications of that design. If Contractor use any other product, material, or equipment other than the first named one the Contactor shall, at its cost:
   1. Make all revisions and modifications to the design and construction of the Work necessitated by the use of the product, material or equipment.
   2. Be responsible for all costs of any changes resulting from the use of the product, material or equipment including without limitation, costs or changes which affect other parts of work.
   3. Contractor shall submit within 70 days of bid award prepared specifications and drawings, prepared, stamped and signed by an appropriate licensed engineer, depicting all revisions to design and construction of the work necessitated by the substitution.

1.09 DRAWINGS AND SPECIFICATIONS

A. Data given herein and on the plans are exact as could be secured, but their absolute accuracy is not guaranteed. Plans and specifications are for the assistance and guidance of the Contractor and exact locations, distances, levels and other data will be governed by the structures. The Contractor shall provide a layout plan of all electrical equipment showing actual dimensions and working clearances. The Contractor is responsible for ensuring that all electrical equipment will fit and no working clearances are exceeded.

B. Clarification of plans and specifications for the purpose of facilitating construction, but not involving additional labor and materials, may be prepared during construction by the Contractor and reviewed by the Architect. Said revised plans and specifications shall become a part of the contract. The Contractor shall conform to the revised plans and specifications at no additional cost to the Owner.

C. Layouts of equipment, accessories, and wiring systems are diagrammatic but follow these as closely as possible. Examine Architectural, Structural, and Mechanical and other drawings, noting all conditions that may affect this work. Report conflicting conditions to the Owner for adjustment before proceeding with the work. Should the Contractor proceed with work without so reporting the matter, they do so on their own responsibility and shall alter work if directed by the Owner at the Contractor's own expense.

D. The right is reserved to make minor changes in locations of equipment and wiring systems shown, providing the change is ordered before conduit runs and/or work directly connected to same is installed and no extra materials are required.

1.10 UTILITY COORDINATION

A. Coordinate with the electric utility company, the telephone company, and the cable television company whenever necessary, to determine service equipment requirements, conduit and backfill requirements, electric metering requirements and other requirements to provide complete utility services, adequate to supply the electrical, communication, and television system(s) indicated. Provide materials that are specified in Division 26 in addition to conforming to utility company requirements.

B. Include in bid, all work required by the utility companies. All work required for utility services shall be in accord with contract documents, specifications, drawings and as required by the utility companies.

C. Use extreme caution when digging to avoid buried electrical cables, conduits, and piping.
   1. Call "UNDERGROUND SERVICE ALERT" (U.S.A.): 811 or 1-800-642-2444 two (2) working days before digging to verify underground utilities.
   2. Construction area contains existing power and single conduits/conductors and the locations are unknown. The Contractor shall use ground penetration radar (GPR) to identify underground infrastructure (conduits and pipes) and hand dig around existing underground infrastructure (conduits and pipes).

1.11 HOMERUNS AND MAXIMUM NUMBER OF CIRCUITS

A. 120 VAC, 20 A circuit- Maximum of (9) #12 conductors in conduit (assume ambient temp for 120 Deg F, 90 Deg C wire). Homeruns may combine branch circuits by using a maximum of (20) # 10 conductors in 1.25" minimum diameter conduit.

1.12 CUT OVER

A. Prepare, submit and implement the cut over procedure. Provide all necessary materials, equipment, services, and rentals (e.g., temporary generators, UPS, ATS) for the cut over. No disruption in power or any interference with Operations is permitted without Owner's approval. Have cut over coordination meetings with all necessary participants (Owner, Architect, Engineers, Vendors, Contractor) at least 2 weeks before preparing the cut over procedure and before conducting the approved procedure. Additional meetings may be required (e.g., resolve start up issues).

1.13 SUPERVISION

A. Provide adequate and competent supervision. Maintain complete control of the project execution and complete liability for the materials and work until the job is completed and accepted by the Owner.

1.14 MANUFACTURER'S INSTRUCTION

A. Follow the manufacturer's instructions when specific installation or connection details are not indicated or specified.

B. Notify the Architect of conflicts between the manufacturer's instructions and installation or connection details prior to the installation of materials.

1.15 WORKMANSHIP

A. Firmly and permanently secure in place all electrical equipment to the structure so that it is level, plumb, and true with the structure and other equipment. Installation methods shall be as recommended by the National Electrical Contractors' Standard of Installation, except when methods specified or shown on the plans differ. The minimum installation standards shall be as required by the Codes.

1.16 PROTECTION

A. Protect all equipment and materials required for the performance of this work from damage by the elements, vandalism, or work during construction.
   1. Do not subject the work and materials to damage during execution of the work in this division of the specifications.

1.17 COORDINATION

A. Coordinate the sequence of construction to ensure that all work proceeds with a minimum of interference and delay.

1.18 EXAMINATION OF SITE

A. Examine the site prior to bid to determine existing site conditions that may affect the work. No allowance will be allowed for any extra work required due to a failure to recognize, or negligence to discover conditions prior to bid.

1.19 STRUCTURAL REQUIREMENTS

A. Secure all anchors for electrical equipment in a manner that will not decrease the structural value of any structure to an unsafe level. Inform the Architect of any proposed modifications to the structure that involves cutting or patching of concrete, masonry, steel, or wood in the project.

1.20 IDENTIFICATION

A. Install nameplates on electrical equipment including:
   1. Individual circuit breakers on switchboards, distribution panelboards and motor control centers.
   2. Motor starters.
   3. Pilot lights, selector switches, overload resets, timers and other pilot control devices.
   4. Panelboards, switchboards, motor control centers, transformers, control cabinets and other major equipment.
   5. Disconnect switches, time switches, contactors, relays and other miscellaneous equipment enclosures.
   6. Light switches for which the control functions are not evident.
   7. Provide labeling on receptacles and light switches which describe the source panel and circuit number. Use clear adhesive label with typed text. Example, "EH-3", that is panel "EH" circuit 3.

B. Describe item, control function of sequence or operation on each nameplate, as applicable.

1.21 TESTS AND REPORTS

A. The Contractor shall prepare and perform Acceptance Tests and visual and mechanical inspections and electrical tests on all affected electrical systems and equipment to prove they perform satisfactorily in all modes of operation. This is in addition to any other testing required by other specifications. Prepare Acceptance Test Procedures for all systems and submit to the Owner for review and approval. Submit at least two weeks before the planned testing.

B. Perform routine insulation-resistance, continuity, equipment settings and rotation tests for all affected distribution and utilization equipment prior to and in addition to tests performed by the testing firm specified herein. Prepare inspection and test reports for all equipment as specified herein and submit to the Owner for review and approval. Submit at least two weeks before the planned testing. Perform these inspections and test prior to or as part of system Acceptance Testing. Examples include:
   1. Grounding systems, for resistance to earth. Provide additional grounding electrodes if main service or separately derived system ground resistance exceed 5 ohms.
   2. Motor circuits with motor disconnected, for resistance to ground.
   3. Control circuits for resistance to ground.
   4. Lighting circuits, for resistance to ground.
   5. Power feeders, for resistance to ground.
   6. Switchboards, Motor Control Centers for resistance to ground.:
   7. Main bus, power and control circuits, for resistance to ground.
      a. Check connection; tighten if necessary.
      b. Operation of each device.
      c. Set relays and trip settings in accord with the reviewer's directions.
      d. Check thermal overload heaters for size and reset operation.
   8. Prior to energization of equipment, check the insulation resistance of listed circuits, with a 500-volt "Megger".
   9. Set circuit protective devices to provide proper long-time, short-time and ground-fault tripping coordination
   10. Coordinate phase rotation of all motors with installer to ensure proper direction of rotation. List motor data:
      a. Item of equipment.
      b. Nameplate data.
      c. Overload heater catalog number and rating.

1.22 DEMONSTRATIONS

A. After testing and final inspection, demonstrate operation of all affected systems and equipment to Owner.

B. Arrange date of test with Owner.

C. Advise the manufacturers' representative to be present when required.

D. Instruct Owner's personnel in operation, adjustment and maintenance of equipment and systems, using the operation and maintenance data as the basis of instruction.

1.23 GUARANTEE

A. Guarantee the electrical work against defects in work or materials for one year after filing of Notice of Completion.

B. Undertake repairs within 24 hours after notice from the Owner.

C. If the operation of the electrical system fails to conform to Division 26 requirements, approved submittals, or operation and maintenance manuals, the Owner may operate the electrical system without liability to Owner. Repair or replace defective or unsatisfactory equipment or systems.

1.24 QUALITY ASSURANCE

A. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

B. Operational Test:
   1. Perform an operational test to assure that the electrical equipment installation complies with all requirements of the Specifications. Test shall be made in the presence of the Owner.
   2. If any part of the system fails the test, it must be corrected and the test repeated until it satisfactorily passes the test.

C. Training:
   1. Provide manufacturer’s system training necessary for the Owner's personnel. The scope of training should include training sequences available at the job site.
   2. The number of persons attending the system training courses shall be determined by the Owner's Representative. The training at the job site shall be provided prior to system approval by the Owner's Representative.
   3. System operating training shall be given by an experienced and competent manufacturer's representative competent with the electrical system.
   4. Provide training per manufactures instruction.
   5. Provide a minimum amount of training:
      a. Lighting and lighting controls; 4 hours
      b. Fire detection and Alarm; 4 hours
      c. Circuit breaker and multipoint metering; 2 hours

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 EQUIPMENT MOUNTING SEISMIC CRITERIA

A. Brace or anchor all electrical equipment to resist a horizontal force acting in any direction using the criteria of Section 1613 and 1615, California Building Code, Title 24, Part 2.

B. Simultaneous vertical force - use 1/3 by horizontal force.

C. Where anchorage details are not shown on the drawings, the field installation shall be subject to the approval of the Architect.

END OF SECTION

SECTION 26 05 02
SUPPORTING FROM BUILDING STRUCTURE

PART 1 GENERAL

1.01 DESCRIPTION

A. This specification defines the seismic design criteria to be used for the design of equipment anchorage and seismic bracing for electrical equipment/components. This section provides guidelines and limitations for supporting all electrical items from the building structure, and for seismic bracing for all such items.

B. The Contractor is responsible for engaging the services of a qualified licensed professional engineer in the state of California with a minimum 5 years of experience in structural seismic design to provide the analysis, calculations, seismic bracing, and installation details for equipment and equipment anchorage, skids and frames in accordance with specified criteria and applicable codes. The Contractor's engineer is to provide construction support during the equipment installation for any field problem that may arise during construction. The Contractor is required to design support and bracing for items for which the contract documents do not provide specific attachment, support, and bracing.

C. Unless the item is classified by the Owner as essential, seismic bracing and restraint may be waived for the following.
   1. Anchorage for equipment with operating weighs less than 400 pounds and is supported at 4 feet or less above the floor.
   2. Temporary or movable equipment when rolling/sliding is prevented and is not subject to tipping.
   3. Equipment weighing less than 20 pounds supported on vibration isolators.
   4. Equipment weighing less than 20 pounds suspended from the floor or roof or mounted to walls.
   5. Verification and investigation on Item C.2, whether the equipment will be tipped over under the code required seismic forces using R=1.0 and 60% of the operating weight, shall be performed by a qualified engineer per Paragraph 1.01B.

D. Seismic bracing is not required for the following items:
   1. All electrical conduits less than 2.5 inches inside diameter, unless racked together.
   2. All conduits mounted less than 12" from hanger anchorage.

E. Design and install all support and bracing systems except as noted. Provide for attachment to portions of the building structure capable of bearing the loads imposed. Design systems to not overstress the building structure

1.02 RELATED REQUIREMENTS

A. Section 26 01 00: General Requirements for Electrical Work.

B. Structural Specifications.

C. Section 260503: Seismic Certification of Equipment and Non-Structural Components.

1.03 REFERENCES

A. California Building Code (CBC), with local amendments where the project is located.

B. American Society of Civil Engineers (ASCE), ASCE 7, Minimum Design Loads for Buildings and Other Structures.

C. American Society of Heating and Ventilating and Air Conditioning (ASHRAE), HVAC Applications, Latest Edition, Seismic and Wind Restrain Design.
   1. The lateral force equations in ASCE 7, as appropriate, should be used to determine the lateral seismic force. The force calculations found in these standards are based on a previous code provision that may not comply with the latest ASCE 7.

D. American Society of Mechanical Engineers (ASME), including addendum through the latest edition.

E. Structural Engineers Association of California, Recommended Lateral Force Requirements and Commentary, Latest Edition.

F. Seismic Restraint Manual Guidelines for Mechanical Systems, Latest Edition (SMACNA).

1.04 SYSTEM DESCRIPTION

A. Site Criteria: Obtain the required parameters from the Structural Specifications/Structural Engineer of Record.

B. Design Requirements
   1. All electrical equipment/devices, attachments and supports shall be designed to withstand the specified seismic loads and comply with the latest ASCE 7 seismic design detailed requirement for strength and displacement.
   2. Equipment design is solely the responsibility of the equipment supplier. The equipment shall be designed so the strength and anchorage of the internal and external components or equipment piping exceed that of the forces used to restrain and to anchor the equipment to the supporting structure. Guidance as to which pieces of equipment and parts require seismic design can be found in the commentary section of SEAOC Recommended Lateral Force Requirements and Commentary, specifically Section C107. Equipment with flexible and /or cantilevered lateral system shall be avoided.
   3. Seismic design parameters as defined by the latest ASCE 7.
      a. Rp for anchorage shall consider the ductility and the embedment depth of the anchor.
      b. Additional factor for anchorage to cracked concrete and masonry structure shall be applied as required by codes.
   4. Components and Equipment Supported by Structures.
      a. The lateral force is to be applied at the center of mass of the component and can act in any lateral direction.
   5. Seismic restraint for electrical system is to be designed per the latest ASCE 7 - seismic design requirements.

C. Connection Requirements
   1. Component attachments are to be welded, bolted, or otherwise positively connected without consideration of frictional resistance resulting from gravity loads. Do not weld on any joists or beams without written approval from Structural Engineer.
   2. Attachments to concrete shall be made with anchors suitable for cyclical loads. Expansion or chemical anchors not rated for Seismic Design Category “D”, “E” & “F” shall not be used for seismic anchorage.
   3. Powder driven fasteners shall not be used for tension load applications.
   4. Friction clips shall not be used for anchorage.
   5. Welded plate washers with standard holes shall be used at bolted connections with oversized holes on the base plate.
   6. Unless the base sheet metal is reinforced with stiffeners and is designed to take the bending from the uplift forces, oversized plate washers shall be used at bolted connection through the base sheet metal.
   7. Isolators must be designed to withstand the seismic loads. Provide snubbers if the isolator cannot withstand the specified load and see below for the design force.
   8. Components mounted on vibration isolator system shall have a bumper restraint or a snubber in each horizontal direction. The design force is to be taken as 2Fp unless the nominal clearance (air gap) between the frame and restraint is equal or less than 0.25”.

D. Refer to structural drawings for material specifications of structure. If no structural drawings are available, assume 3000 psi concrete and ASTM A36 steel for attachment design and confirm these values with Structural Engineer before proceeding with the design.

E. Deformation Compatibility
   1. The design and detailing of anchorage and restraints shall accommodate following building drift.
      a. Lateral deformation within the Building 0.010 times height for the code design basis seismic event.

b. Vertical deformation compatibility crossing the base isolation boundary ± 1 inch

2. Do not brace any equipment to parts of building structure which may respond differently during earthquake. Do not pass seismic bracing through building expansion and contraction joints.
3. The equipment frame inelastic displacement due to the seismic loads shall not exceed the codes' allowable displacement, and it shall be limited so as not to damage any piping and accessories attached to it.

1.05 SUBMITTALS

A. Calculations and Drawings.
1. Submit structural calculations and a separate drawing stamped and signed by the California Licensed Professional Engineer in good standing. The calculations and drawings shall include the following information as minimum:
a. Empty weight
b. Operating weight
c. Center of mass in plan
d. Center of mass in elevation
e. Seismic vertical, lateral, and overturning loads
f. Impact loads
g. Vibration loads
h. Load combinations in accordance with applicable codes
i. Foundation reactions
j. Isolator reactions where isolators are used
k. Anchor bolt brand, type, size, embedment depth in concrete, grip distance, and locations, including specific drilling and special inspection requirement
l. Platform design layout, structural loads, material list, and connection details
m. Installation sequence if it requires specific sequence to fasten the anchorage
2. Coordination drawings to demonstrate interface with adjacent systems including location and space required for seismic bracing and anchorage.
3. Furnish certification letter in the calculations stating the design of the equipment components and anchorage comply with the seismic design requirement per ASCE 7 13.2.2.a. and applicable local building codes.

B. Installing contractor to submit following reports to Structural Engineer and Building Official
1. Bolt inspection reports for field installed bolts for structural components including the location of the test, date of the test, bolt diameter, and recorded torque.
2. Non-destructive testing program for welding and anchors.
3. Field weld inspection reports for structural welds including the type of weld, location of the weld, nondestructive testing procedure and results, welder certification, qualified welding description or number in accordance with the latest AWS D1.1.
4. Reports covering other structural activities requiring inspection in accordance with the applicable local building codes.

PART 2 PRODUCTS

2.01 MATERIALS

A. Furnish all substructures and fasteners required to comply with the limitations given below. Use materials as specified in the various sections and as appropriate to the use.

B. All exterior materials: Hot dipped galvanized or stainless steel.

PART 3 EXECUTION

3.01 GUIDELINES & LIMITATIONS

A. The General Contractor shall coordinate the load requirements so that no combination of loads exceeds the limitations given below.

B. Steel Structure:
   1. At both the floor and the roof, attachments may be at the upper or the lower truss chord (horizontal members at top and bottom of truss). Hang no loads from web members (the diagonal and vertical members between chords), including the end diagonal member where the lower chord is discontinuous.
   2. Make the point of attachment at a panel point of the truss girders or joints. (The panel points are the intersections of the horizontal chords with the diagonal or vertical web members.)
   3. Make no attachments to metal decking.
   4. Do no welding on any trusses. Use bolted or clamped type connections.
   5. At floor and roof joists, hang only concentric loads, not one side loaded. At all other members (W beams and truss girders) hang all loads greater than 40 pounds Concentric.
   6. Attach no loads greater than the following without specific approval of Engineer.
      a. Floor joists and girders: 500 pounds points load. 1000 pounds total for a single span.
      b. Roof joists and girders: 300 pounds points load. 600 pounds total for a single span.

C. Other Structures: Coordinate with the Structural Engineer of Record for criteria.

END OF SECTION

SECTION 26 05 03
SEISMIC CERTIFICATION OF EQUIPMENT AND NON-STRUCTURAL COMPONENTS

PART 1 GENERAL

1.01 SUMMARY

A. Special Seismic Certification of equipment/components is required per CBC 1708A for Essential Facilities as defined in CBC 1604A.5 (Occupancy Category IV). The intent of seismic certification is to ensure that equipment/components that are essential to life safety that must remain operable immediately after a seismic event. It is the Contractors responsibility to ensure all required equipment/components subject to this requirement are seismically certified and are installed, tested and inspected properly per code and AHJ requirements

B. For OSHPD 1&4 Active or energized components shall be certified exclusively on the basis of approved shake table testing in accordance with ASCE 7 Section 13.2.5 or experience data in accordance with ASCE 7 Section 13. 2.6 unless it can be shown that the component is inherently rugged by comparison with similar seismic certified components. Certification shall be per OSHPD CAN 2-1708A.5

1.02 ESSENTIAL FACILITY BUILDINGS

A. The following buildings have been determined to be Essential Facilities subject to CBC 1708A:
   1. Operational Coordination Center (OCC)
   2. The Electrical/Emergency Generator Building
   3. OCC Emergency Generator including enclosure and tank

1.03 LIST OF EQUIPMENT AND COMPONENTS REQUIRING SPECIAL SEISMIC CERTIFICATION

A. The following applicable equipment and components require Special Seismic Certification:
   1. Switchgear.
   2. Transformers.
   3. Distribution panels including electrical panel boards.
   4. Control panels, including fire alarm, fire suppression, pre-action, and auxiliary or remote power supplies.

B. Exceptions
   1. Equipment and components are installed in nonconforming buildings, unless the equipment or components provides a service/system or utility to conforming buildings, or building is designated as SPC 3 or higher.
   2. Equipment and components weighing not more than 20 lbs. supported directly on structures (and not mounted on other equipment or components) with supports and attachments in accordance with ASCE 7 Chapter 13 as modified by Section 1615A.
   3. Equipment and components that are considered to be rugged are deemed to comply with Section 13.2.6, ASCE/SEI 7-05 and are exempt from the requirements of this section.

1.04 RUGGED EQUIPMENT AND COMPONENTS

A. The equipment and components listed below are considered rugged and shall not require Special Seismic Certification:
   1. Valves (not in cast-iron housings, except for ductile cast iron).
   2. Pneumatic operators.
   3. Hydraulic operators.
   4. Motors and motor operators.
   5. Horizontal and vertical pumps (including vacuum pumps).
   6. Air compressors.
   7. Refrigerators and freezers.
   8. Microwave ovens for patient service.
   9. Elevator cabs.

10. Equipment and components weighing not more than 20 lbs. supported directly on structures (and not mounted on other equipment or components) with supports and attachments in accordance with Chapter 13, ASCE/SEI 7-05, as modified by Section 1614A, CBC.

1.05 REFERENCES

A. California Building Code (CBC), 2010 with local amendments where the project is located.

B. American Society of Civil Engineers (ASCE), ASCE 7, Minimum Design Loads for Buildings and Other Structures, 2005

C. American Society of Heating and Ventilating and Air Conditioning (ASHRAE), HVAC Applications, Latest Edition, Seismic and Wind Restrain Design

D. The lateral force equations in ASCE 7, as appropriate, should be used to determine the lateral seismic force. The force calculations found in these standards are based on a previous code provision that may not comply with the latest ASCE 7.

E. American Society of Mechanical Engineers (ASME), including addendum through the latest edition

F. Structural Engineers Association of California, Recommended Lateral Force Requirements and Commentary, Latest Edition

G. Seismic Restraint Manual Guidelines for Mechanical Systems, Latest Edition (SMACNA)

H. OSHPD CAN 2-1708A.5

1.06 CRITERIA

A. Site Criteria

1. The equipment and major components shall be suitable for and certified by actual seismic testing to meet all applicable seismic requirements of the California Building Code 1708A Site Classification. The site coefficients Fa, and spectral response accelerations of SS , S1 shall be per the Structural Engineer specifications for the project location (latitude and longitude). The test response spectrum shall be based upon a 5% damping factor, and a peak (SDS) applied at the base of the equipment in the horizontal direction. The forces in the vertical direction shall be at least 66% of those in the horizontal direction. The tests shall cover a frequency range from 1 to 100Hz. Guidelines for the installation consistent with these requirements shall be provided by the equipment manufacturer and based upon testing of representative equipment. Equipment certification acceptance criteria shall be based upon the ability for the equipment to be returned to service immediately after a seismic event within the above requirements without the need for repairs.
2. Occupancy Category is IV
3. Importance Factor Ip = 1.5 for equipment in Operations Coordination Center (OCC), Administration Building, Electrical/ Emergency Generator Building, OCC Generator Enclosure and Communication Tower. Ip=1.0 (all other equipment locations)
4. Special Seismic Certification for Equipment shall apply to and meet or exceed the above site-specific criteria.

END OF SECTION

SECTION 26 05 19
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 SUMMARY

A. The work required under this section of the specifications consists of furnishing, installing and connecting the building wiring system, 600 volts and below. Exterior branch circuit wiring and feeder conductors extended beyond the building are included. Wiring systems for communication and alarm systems are not included in this section unless specified to be included, by reference, in the respective specification sections for alarm and communication systems.

1.02 DESCRIPTION

A. This section describes requirements for wire and cable.

1.03 RELATED WORK

A. Section 26 01 00: General Requirements for Electrical Work.

1.04 REFERENCE STANDARDS

A. NETA STD ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems; International Electrical Testing Association; 2009.

1.05 SUBMITTALS

A. Procedure: Submit under provisions of Section 01 30 00 - Administrative Requirements and Section 01 60 00 - Product Requirements.

B. Provide submittals for items listed documenting compliance with specification requirements.

C. Product Data:
   1. Electrical Materials: Manufacturer’s current published catalog sheets.

PART 2 PRODUCTS

2.01 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

A. Provide products that comply with requirements of California Electrical Code.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Provide conductors and cables with lead content less than 300 parts per million.

D. Provide new conductors and cables manufactured not more than one year prior to installation.

E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.

F. Comply with NEMA WC 70.

G. Comply with FS A-A-59544 where applicable.

H. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.

I. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.

J. Conductors for Grounding and Bonding: Also comply with Section 26 05 26.

K. Conductors and Cables Installed in Cable Tray: Listed and labeled as suitable for cable tray use.

L. Conductors and Cables Installed Where Exposed to Direct Rays of Sun: Listed and labeled as sunlight resistant.

M. Conductors and Cables Installed Exposed in Spaces Used for Environmental Air (only where specifically permitted): Plenum rated, listed and labeled as suitable for use in return air plenums.

N. Conductor Material:
   1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
   2. Provide copper conductors except where aluminum conductors are specifically indicated. Substitution of aluminum conductors for copper is not permitted. Conductor sizes indicated are based on copper unless specifically indicated as aluminum. Conductors designated with the abbreviation "AL" indicate aluminum.
   3. Provide copper conductors except where aluminum conductors are specifically indicated or permitted for substitution. Conductor sizes indicated are based on copper unless specifically indicated as aluminum. Conductors designated with the abbreviation "AL" indicate aluminum.
      a. Where aluminum conductors are substituted for copper, comply with the following:
         1) Size aluminum conductors to provide, when compared to copper sizes indicated, equivalent or greater ampacity and equivalent or less voltage drop.
         2) Increase size of raceways, boxes, wiring gutters, enclosures, etc. as required to accommodate aluminum conductors.
   4. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
   5. Tinned Copper Conductors: Comply with ASTM B33.
   6. Aluminum Conductors (only where specifically indicated or permitted for substitution): AA-8000 series aluminum alloy conductors recognized by ASTM B800 and compact stranded in accordance with ASTM B801 unless otherwise indicated.

O. Conductor Color Coding:
   1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
   2. Color Coding Method: Integrally colored insulation.
   3. Color Code:
      a. Equipment Ground, All Systems: Green.

2.02 NONMETALLIC-SHEATHED CABLE

A. Manufacturers:
   1. Cerro Wire LLC: www.cerrowire.com/#sle.
   2. Encore Wire Corporation: www.encorewire.com/#sle.
   3. Southwire Company: www.southwire.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: NFPA 70, Type NM multiple-conductor cable listed and labeled as complying with UL 719, Type NM-B.

C. Conductor Stranding:
   1. Size 10 AWG and Smaller: Solid.
   2. Size 8 AWG and Larger: Stranded.

D. Insulation Voltage Rating: 600 V.

2.03 SERVICE ENTRANCE CABLE

A. Manufacturers:
   1. Copper Service Entrance Cable:
      a. Cerro Wire LLC: www.cerrowire.com/#sle.
      b. Encore Wire Corporation: www.encorewire.com/#sle.
      c. Southwire Company: www.southwire.com/#sle.
   2. Aluminum Service Entrance Cable:
      a. Encore Wire Corporation: www.encorewire.com/#sle.
      b. General Cable Technologies Corporation: www.generalcable.com/#sle.
      c. Southwire Company: www.southwire.com/#sle.

d. Stabiloy, a brand of General Cable Technologies Corporation: www.stabiloy.com/#sle.

B. Service Entrance Cable for Above-Ground Use: NFPA 70, Type SE multiple-conductor cable listed and labeled as complying with UL 854, Style R.

C. Service Entrance Cable for Underground Use: NFPA 70, Type USE single-conductor cable listed and labeled as complying with UL 854, Type USE-2, and with UL 44, Type RHH/RHW-2.

D. Conductor Stranding: Stranded.

E. Insulation Voltage Rating: 600 V.

2.04 ARMORED CABLE

A. Manufacturers:
1. AFC Cable Systems Inc: www.afcweb.com/#sle.
2. Encore Wire Corporation: www.encorewire.com/#sle.
3. Southwire Company: www.southwire.com/#sle.

B. Description: NFPA 70, Type AC cable listed and labeled as complying with UL 4, and listed for use in classified firestop systems to be used.

C. Conductor Stranding:
1. Size 10 AWG and Smaller: Solid.
2. Size 8 AWG and Larger: Stranded.

D. Insulation Voltage Rating: 600 V.

E. Insulation: Type THHN.

F. Grounding: Combination of interlocking armor and integral bonding wire.

G. Armor: Steel, interlocked tape.

2.05 METAL-CLAD CABLE

A. Manufacturers:
1. AFC Cable Systems Inc: www.afcweb.com/#sle.
2. Encore Wire Corporation: www.encorewire.com/#sle.
3. Southwire Company: www.southwire.com/#sle.

B. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.

C. Conductor Stranding:
1. Size 10 AWG and Smaller: Solid.
2. Size 8 AWG and Larger: Stranded.

D. Insulation Voltage Rating: 600 V.

E. Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.

F. Grounding: Full-size integral equipment grounding conductor.

G. Armor: Steel, interlocked tape.

2.06 POWER AND CONTROL TRAY CABLE

A. Manufacturers:
1. Encore Wire Corporation: www.encorewire.com/#sle.
2. General Cable Technologies Corporation: www.generalcable.com/#sle.
3. Okonite: www.okonite.com/#sle.
4. Southwire Company: www.southwire.com/#sle.

B. Description: NFPA 70, Type TC cable listed and labeled as complying with UL 1277.

C. Conductor Stranding: Stranded.

D. Insulation Voltage Rating: 600 V.

E. Insulation: Type XHHW or XHHW-2.

F. Grounding: Full-size integral equipment grounding conductor.

G. Jacket: PVC or Chlorinated Polyethylene (CPE).

2.07 WIRE AND CABLE

A. Conductor: Insulated copper, individual conductors, 98 percent conductivity, stranded.
   1. Power conductors, #12 AWG, minimum to 750 MCM, stranded.

B. Insulation:
   1. Rated 600 volts as follows:
   2. 90 DEG. Celcius

Item	Size (AWG)	Insulation Type
Branch Circuits (dry and damp locations)	#12 to #4/0	THHN
Branch Circuits (wet)	#12 to #4/0	THWN-2 (Okonite for #12-10, or equal)
Fixture Taps (dry & damp)	#12	THHN
Feeders (dry & damp)	#12 to #750 MCM	THHN
Feeders (wet)	#12 to #750 MCM	RHW-2, USE-2, THWN-2 XHHW-2
Controls (dry & damp)	#14 to #10	THHN
Controls (wet)	#14 to #10	THWN-2 (Okonite or equal)

2.08 WIRE CONNECTIONS

A. Connect wire to binding post screw, stud, bolt or bus as follows:
   1. #10 AWG and smaller conductors, compression type, nylon, self-insulated grip spade lugs, T & B "Sta-Kon", Buchanan "Termend", Panduit "Pan-Term", or equal.
   2. #8 AWG to #750 MCM copper conductors, solderless lug type mechanical copper connectors, with hex-head or allen type compression set screws with configuration to suit application, Burndy "QA", or equal.
   3. #8 AWG to #750 MCM copper conductors, compression. Burndy YA-L,YA-L-TC series or equal

B. Conductor Taps:
   1. #12 through #750 copper conductors, mechanical type for stranded copper wire. Burndy: KS,KS3,KVS,KVSW,QPX, or equal.
   2. #12- #4/0 copper conductors, compression C type, Burndy YC-C series or equal.
   3. #4- #750 MCM cooper conductors, compression T type, Burndy YST or equal

C. Splice wire as follows:
   1. #10 AWG and smaller conductors, twist-on solder-less, insulated spring connectors, 3M "Scotchloks", T & B "Piggys" or equal.
   2. #8 AWG to #750 MCM copper conductors, two-way connectors. Burndy: AMS or equal.

3. #8 AWG to #750 MCM copper conductors, compression connectors: Burndy: YS-L,YS,YS-T series or equal
4. Underground applications-Splice in underground pull box. Apply cast resin splice kit. 3M:85 Series or equal.

D. Size, install and tighten wire terminal and splice connectors in accordance with manufacturer's instructions using only the manufacturer's recommended tooling. Copper connectors shall be used for copper conductors. Aluminum connectors shall be used for aluminum conductors.

2.09 TAPE

A. Wire Splices: Vinyl plastic electrical tape, 8.5-mil and 4.0-mil, Scotch 33.

B. Conduit Wrapping: 10-mil vinyl wrapping tape, Manville, Minnesota Mining and Manufacturing Company.

2.10 WIRING ACCESSORIES

A. Identify conductors with self-adhesive vinyl cloth markers, sized to fit the conductor insulation, with machine printed black marking, W.H. Brady, Thomas and Betts, or equal.

PART 3 EXECUTION

3.01 INSULATED CONDUCTORS AND CABLE

A. Install all wiring in raceway system, except where conductors are indicated or specified not to be installed in raceway. Any conductors found to be damaged or defective, including insulation damaged during installation, shall be removed and replaced at no expense to the Owner.
1. Pull conductors into raceway simultaneously where more than one is being installed in the same raceway.
2. Use UL listed pulling compound or lubricant where necessary to reduce cable pulling tension below the manufacturer's recommended levels. Compound used shall not deteriorate conductor or insulation.
3. Use pulling means, including fish tape, cable rope, or basket-weave wire/cable grips that will not damage cable or raceway.

B. Connect all conductors. Torque each terminal connection to the manufacturers recommended torque value. A calibrated torquing tool shall be used to insure proper torque application

C. Conductors shall be tested to be continuous and free of short circuits and grounds.

D. Maintain phase rotation established at service equipment throughout entire project

E. Group and tie with cable ties (T & B "Ty-Rap", or equal) all conductors within all enclosures, i.e., panels, motor controllers, equipment cabinets, switchboards, etc.

F. Make splices in conductors only within junction boxes, wiring troughs and other enclosures as permitted by the California Electrical Code. Do not splice conductors in pull boxes, panel boards, safety switches, switchboard, switchgear, motor control center, or motor control enclosures.

G. Support conductors installed in vertical raceways at intervals not exceeding those distances indicated in the California Electrical Code. Support conductors in pull boxes with bakelite wedge type supports or "Kellem" grips or equal, provided for the size and number of conductors in the raceway. Do not splice conductors in pull boxes used for vertical cable supports unless written permission for splicing is obtained.

H. Make connections between fixture junction box and fixture with fixture wire.

I. Control, communications or signal conductors shall be installed in separate raceway systems from branch circuit or feeder raceway, unless indicated otherwise on the drawings.

J. Conductor lengths for parallel circuits shall be equal. Do not configure isolated phasing in separate conduits for parallel conductors.

K. Install a minimum of 12” (300 mm) of slack conductor at each outlet.

L. Thoroughly clean conductors prior to installing lugs and connectors.

M. Secure portable cables in accordance with the CEC. Install strain relief devices to prevent tension on terminations if cable is pulled. Install cable grips on drops and connect to outlet box or structure. Leave slack cable loop at drop point.

N. Color code conductors by phase sequence A-B-C when looking into the front of the equipment from left-to-right, top-to-bottom or front-to-back. Provide conductors with the appropriate phase color or mark conductors with a minimum of 6 inches of phase tape on ends connected to terminals. Phase code conductors as listed:

Voltage	Phase A	Phase B	Phase C	Neutral	Ground
120/208	Black	Red	Blue	White	Green
277/480	Brown	Orange	Yellow	Grey	Green
120/240	Black	Orange	Blue	White	Green

O. Identify all conductors with their respective circuit numbers at all boxes and terminals.

P. Connections:
1. Use twist-on solder-less connectors for splicing receptacle and lighting circuits #10 AWG wire size and smaller.
2. Splice #12 and #10 AWG stranded conductors with compression connectors.
3. Terminate conductors at motors with bolted connections, insulated with plastic tape.
4. For conductor taps #8 through #750 MCM, provide mechanical copper connectors.
5. For splices larger than #10 AWG, insulate and smooth the splice with insulation putty, tape with one half-lapped layer of 8.5-mil vinyl plastic electrical tape and two half-lapped layers of 7.0-mil vinyl plastic electrical tape.
6. Use cast resin epoxy splices for splices in underground pullboxes.
7. Wrap all wire and cable operating at 480 volts AC or more with electric arc and fireproofing tape where wires are installed with other wires or cables.

END OF SECTION

SECTION 26 05 26
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

A. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.
   1. Includes oxide inhibiting compound.

B. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

1.02 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

B. NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings; 2007.

C. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

1.03 SUMMARY

A. This section describes requirements for grounding of the power and communications systems.

1.04 DESCRIPTION

A. Provide all equipment and materials for a complete grounding system.
   1. Power System Grounding.
   2. Communications System Grounding.
   3. Electrical Equipment and Raceway Grounding and bonding.

1.05 RELATED REQUIREMENTS

A. Section 26 01 00: General Requirements for Electrical Work.

1.06 REFERENCE STANDARDS

A. National Electrical Manufacturers Association (NEMA).

B. American National Standards Institute (ANSI).

PART 2 PRODUCTS

2.01 GROUNDING AND BONDING REQUIREMENTS

A. Existing Work: Where existing grounding and bonding system components are indicated to be reused, they may be reused only where they are free from corrosion, integrity and continuity are verified, and where acceptable to the authority having jurisdiction.

B. Do not use products for applications other than as permitted by NFPA 70 and product listing.

C. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.

D. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.02 GROUNDING AND BONDING COMPONENTS

A. General Requirements:
   1. Provide products listed, classified, and labeled as suitable for the purpose intended.
   2. Provide products listed and labeled as complying with UL 467 where applicable.

B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 26 05 26:

1. Use insulated copper conductors unless otherwise indicated.
    a. Exceptions:
        1) Use bare copper conductors where installed underground in direct contact with earth.
        2) Use bare copper conductors where directly encased in concrete (not in raceway).

C. Connectors for Grounding and Bonding:
1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.

D. Ground Bars:
1. Description: Copper rectangular ground bars with mounting brackets and insulators.
2. Size: As indicated.
3. Holes for Connections: As indicated or as required for connections to be made.

E. Ground Rod Electrodes:
1. Comply with NEMA GR 1.
2. Material: Copper-bonded (copper-clad) steel.
3. Size: 3/4 inch (19 mm) diameter by 10 feet (3.0 m) length, unless otherwise indicated.

F. Pre-Fabricated Signal Reference Grids:
1. Description: Factory pre-fabricated grid manufactured from 2 inch wide (50 mm wide), 26 gage, flat copper strips spaced on 24 inch (610 mm) centers, factory-welded at each crossover.
2. Low Impedance Risers: Factory fabricated 2 inch wide (50 mm wide), 26 gage, flat copper strips designed for connecting equipment enclosures to pre-fabricated signal reference grid.

G. Oxide Inhibiting Compound: Comply with Section 26 05 19.

2.03 ACCEPTABLE MANUFACTURERS

A. Thomas and Betts Appleton, Raco, Oz Gedney, Blackburn, or approved equal.

2.04 MATERIALS

A. Ground Clamp: Water pipe connection, bronze two piece with serrated jaws, lug sized for grounding electrode conductor.

B. Connectors, Compression Type: Bronze or Copper, pretreated with conductive paste, sized for conductor to which applied.

C. Connectors, Exothermic Weld Type: Powder actuated weld. Bond made through exothermic reaction producing molten copper from premixed copper oxide and aluminum powder. Form bond in mold or crucible.

2.05 SECONDARY GROUNDING SYSTEM

A. The main grounding system shall consist of bare copper ground wires connected to a UFER ground placed below the bottom of the structural slab. The grounding system shall include, but is not limited to ground cables, fittings, connectors and all other devices and material as required to render the system complete and meet the requirements of California Electrical Code (CEC) Article 250. Connect grounding system to all building columns.

B. Except where specifically indicated otherwise, all exposed non-current carrying metallic parts of electrical equipment, metallic raceways systems, grounding conductor in nonmetallic raceways and neutral conductor of the wiring system shall be grounded. The ground connection shall be made at the main service equipment of each service and shall be extended to all required components of CEC Article 250.

2.06 COMMUNICATIONS GROUNDING SYSTEM

A. All intermediate distribution frame (IDF) and main distribution frame (MDF) rooms shall have a Telecommunication Ground Bus Bar installed. Refer to drawings for specific size and assembly.

B. The telecommunication service entrance MDF, shall have a minimum of a #2 AWG conductor with green outer sheath installed to the Telecommunication Ground Bus Bar located in the room.

C. Except where specifically indicated otherwise, all facility MDFs shall have a minimum of a #4 AWG conductor with green outer sheath installed to the Telecommunication Ground Bus Bar located in each room.

D. Except where specifically indicated otherwise, all facility IDFs shall have a minimum of a #6 AWG conductor with green outer sheath installed to the Telecommunication Ground Bus Bar located in each room.

2.07 GENERAL BRANCH CIRCUITS GROUNDING

A. All grounding conductor wire shall be insulated green copper conductors.

B. All conduit bushings shall be grounding type.

C. All grounding connections shall be made with solderless lugs and nonferrous hardware.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that work likely to damage grounding and bonding system components has been completed.

B. Verify that field measurements are as indicated.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or provide ground plates.
   1. Outdoor Installations: Unless otherwise indicated, install with top of rod 6 inches (150 mm) below finished grade.
   2. Indoor Installations: Unless otherwise indicated, install with 4 inches (100 mm) of top of rod exposed.

D. Make grounding and bonding connections using specified connectors.
   1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
   2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
   3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
   4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
   5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

E. Identify grounding and bonding system components in accordance with Section 26 05 53.

3.03 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.13.

D. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.

E. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

F. Submit detailed reports indicating inspection and testing results and corrective actions taken.

3.04 INSTALLATION OF THE MAIN SERVICE ENTRANCE GROUND

A. Provide a main service entrance grounding system with cables, connections, and ground buses as shown on the drawings and specified. Provide all necessary materials and testing of the grounding system.

B. Where available the incoming water service, sprinkler system piping, building steel, UFER ground mat, footing electrode ground rod, and grounding ring encircling the building shall all be bonded together to form a grounding electrode system per CEC Section 250.

C. Install the grounding system to obtain a ground resistance of the grounding grid not to exceed 5 ohms. Provide testing of the ground grid to obtain a ground resistance rating. If the resistance exceeds 5 ohms, contact the Owner's representative for review of installation and additional procedures.

3.05 UFER GROUND SYSTEM

A. UFER Ground System shall consist of a bare service ground copper ground conductor connected to a UFER ground placed below the bottom of the structural slab in contact with the earth.

B. UFER Ground Mat: Form a continuous conductor mat by serpentining No. 500 MCM bare copper conductor of minimum length 60 feet in the bottom of the structure foundation footing. The maximum resistance of the ground mat shall not exceed 5 ohms under normally dry conditions. If this ground resistance cannot be obtained with the 60 feet of mat conductor, additional mat shall be installed in contact with the earth in the bottom of the structural foundation.

3.06 TELECOMMUNICATION GROUND SYSTEM

A. Provide a separate grounding schematic diagram in accordance with Telecommunications Industry Association (TIA)/ Electronic Industries Alliance (EIA)-606 Administration Standard guidelines for telecommunication system.

3.07 GENERAL BRANCH CIRCUITS AND FEEDERS

A. All conduit systems, equipment housings, material housings, junction boxes, cabinets, motors, ducts, wireways, cable trays, light fixtures, portable equipment and all other conductive surfaces shall be solidly grounded in accordance with the California Electrical Code to form a continuous, permanent and effective grounding system.

B. Install a separate green grounding conductor in all conduits, including feeder, branch circuit, and flexible; both metallic and non-metallic. The conduit systems shall not be used as the system equipment grounds. Size all grounding conductors per CEC Article 250 unless a larger ground is indicated on the drawings.

C. All panelboards, junction boxes, pullboxes, wireways and equipment enclosures shall be bonded to the conduit systems.

D. All building expansion joints shall be bonded.

E. Isolated ground receptacles shall have both an isolated ground conductor and a separate equipment grounding conductor.

3.08 MOTOR CIRCUITS

A. All motor circuits shall have a ground wire pulled with the phase conductors. The ground wire shall be extended from the panel ground bus and shall be bonded at all junction boxes, pullboxes, disconnect switches, controllers, motor connection boxes, and motor frames. Each motor with a Variable Frequency Drive (VFD) controller shall have a dedicated grounding conductor. Ground these motors back through the VFD controller as recommended by the drive manufacturer to eliminate radio frequency interference. Also, the wiring between the VFD controller and the motor shall be in a dedicated conduit.

3.09 SEPARATELY DERIVED SOURCES

A. All secondary neutrals for the 120/208-volt wye services of dry type transformers shall be grounded to building steel. Connection shall be made with cable sized according to Table 250-94(a) of the California Electrical Code. Extend separately derived insulated ground to the transformer in rigid steel conduit.

3.10 EQUIPMENT ROOM GROUND TERMINAL BAR

A. Mount bar by anchors and bolts using 1-1/2-inch-long segments of 1/2 inch rigid conduit as spacer between bar and wall. Use a minimum of two supports, 18 inches on center. Connect all grounding electrode system conductors, system enclosure ground bus, and other indicated electrode systems to the terminal bar. Each telecom room shall have a ground bar with a minimum of six lugs or screws. Interconnect telecom/his ground bars to building steel with No. 6 AWG insulated copper conductor.

3.11 FLEXIBLE RACEWAY GROUNDING

A. Install a ground conductor inside all flexible raceways (e.g. flexible steel, liquid tight). Bond the conductor to the enclosure or ground bus in the nearest box or access on either side of the flexible section. Size conductor as specified, indicated or required by code, whichever is larger.

3.12 GENERAL GROUNDING REQUIREMENTS

A. All ground connectors shall be bronze of the clamp type. All clamp accessories such as bolts, nuts, and washers shall also bronze to assure a permanent corrosion-resistant assembly. Connector shall be as manufactured by Burndy Engineering Company, Ilsco Corporation, or equal. Make connections easily accessible for inspection, underground or concealed in floors or walls.

B. All ground cable splices, joints, and connections to ground rods shall be made with an exothermic welding process which shall provide a weld with current-carrying capacity not less than that of the conductors welded. Soldered connections shall not be used.

C. All ground wire shall be insulated, unless otherwise indicated on the Drawings, extra flexible stranded copper cables. Grounding cables installed in earth shall be laid slack.

D. Neutrals throughout the system shall be solidly grounded.

E. Lighting and power panelboards shall be grounded by connecting a grounding conductor to the grounding stud and to the incoming and outgoing feeder conduits grounding bushings. Each grounding-type bushing shall have the maximum ground wire accommodation available in standard manufacturer for the particular conduit size. Connection to the bushing shall be with wire of this maximum size.

F. The equipment for the fire protection alarm system shall have its grounding terminal connected to the ground lug on the panelboard serving the system by means of a #6 green coded insulated conductor, run in 3/4-inch steel conduit, utilizing a ground clamp.

END OF SECTION

SECTION 26 05 29
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A. Provide electrical materials, installation and testing for the project improvements.

1.02 DESCRIPTION

A. This section describes requirements for supporting devices.

1.03 RELATED WORK

A. Section 26 0100: General Requirements for Electrical Work.

1.04 SUBMITTALS

A. Procedure: Submit under provisions of Section 01 3000 - Administrative Requirements and Section 01 6000 - Product Requirements.

B. Provide submittals for items listed documenting compliance with specification requirements.

C. Product Data:
   1. Electrical Materials: Manufacturer’s current published catalog sheets.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:
   1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.
   2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
   3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported with a minimum safety factor of 1.0. Include consideration for vibration, equipment operation, and shock loads where applicable.
   4. Do not use products for applications other than as permitted by NFPA 70 and product listing.
   5. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
      a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
      b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Conduit and Cable Supports: Straps, clamps, etc. suitable for the conduit or cable to be supported.
   1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
   2. Conduit Clamps: Bolted type unless otherwise indicated.

C. Outlet Box Supports: Hangers, brackets, etc. suitable for the boxes to be supported.

D. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
   1. Comply with MFMA-4.

E. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.

F. Anchors and Fasteners:
   1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.

2.02 SUPPORTING DEVICES

A. Conduit Supports:
   1. Straps, one hole galvanized or cadmium plated iron, T & B, Efcor, Appleton, or equal.
   2. Clamp backs, nest backs, galvanized iron or cadmium-plated steel, Efcor, OZ, Steel City, or equal. Plumbers perforated strap, not acceptable.
   3. Hanger Rod, 3/8-inch, minimum galvanized all-thread rod.

B. Conduit Racks:
   1. Framing Channel, steel, hot-dip galvanized or electroplated, Kindorf, Unistrut, Superstrut, or equal.
   2. Channels attached to building or structure surfaces, 14 gauge, 1-5/8 inches wide by 13/16 inches deep. Other channels, 12 gauge minimum, 1-5/8 inches wide by 1-5/8 inches deep, minimum.
   3. Construct racks to limit deflection to 1/360 of span.
   4. Load on trapeze, rod type hangers, concrete inserts and beam clamps, not to exceed 700 pounds per hanger. Provide rigid frames if load exceeds 700 pounds per hanger.

C. Outlet Boxes
   1. Attach device boxes with adjustable bar type hangers screw fastened to two stud/ceiling joists on both sides of box.

D. Anchor Methods:
   1. Hollow masonry anchors.
   2. Solid masonry, malleable iron expansion anchors or preset inserts.
   3. Metal surfaces, machine screws, bolts or welded studs.
   4. Wood surfaces, wood screws.
   5. Concrete surfaces or self-drilling anchors.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive support and attachment components.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

D. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

E. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

G. Equipment Support and Attachment:
   1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
   2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
   3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
   4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

H. Secure fasteners according to manufacturer's recommended torque settings.

I. Remove temporary supports.

END OF SECTION

SECTION 26 05 32
J-HOOKS

PART 1 GENERAL

1.01 SUMMARY

A. Provide electrical materials, installation and testing for the project.

1.02 DESCRIPTION

A. This section describes requirements for j-hooks.

B. Provide one “shared” system of j-hook-supports above corridor ceilings (or other equally accessible areas) for installation of cabling.

C. The shared j-hook supports will consist of a single hanger with strap-type supports for cabling and hook-type supports for other low voltage building system support.

1.03 RELATED WORK

A. Section 26 01 00: General Requirements for Electrical Work.

1.04 SUBMITTALS

A. Provide submittals for items listed documenting compliance with specification requirements.
   1. Product Data.
   2. Electrical Materials: Manufacturer’s current published catalog sheets.

PART 2 PRODUCTS

2.01 DISTRIBUTION PATHWAYS TO INDIVIDUAL OUTLETS

A. Where this document refers to j-hooks for the support of cabling, they are defined as supports for category 5/6 copper, fiber optic, innerduct, and low-voltage cabling. this type of support enforces the practice of "placing" rather than "pulling" cables. For acceptable supports, see the following manufacturers: Erico ("cablecat 425") or B-line, for main runs.

PART 3 EXECUTION

3.01 J-HOOKS

A. Individual branch cables will be supported by cable installers using existing supports or supports they provide. Provide supports at 5 feet-0 inches maximum intervals from the point it leaves the main cable runs to the conduit stub. Provide individual cable supports as manufactured by Erico cablecat 12 wide base cable supports.

B. Attach j-hook supports securely to wood/metal studs or structural wood/metal deck above (slip rods are not permitted).

C. Space j-hook supports 4 feet-0 inches on center if attached to walls.

D. Space j-hook supports 4 feet-0 inches on center if hung from structural deck above.

E. Provide a minimum clearance around j-hook cable path with a minimum radius of 18 inches.

F. Provide sleeves through rated walls. Ez-path (3” x 3” x 10.5” long).

G. Route main j-hook paths so that no outlet is more than 30 feet horizontally from a j-hook support. wherever possible, route j-hooks parallel or perpendicular to interior partition lines.

H. Where the routing path must cross inaccessible ceilings, provide conduit to accommodate the equivalent number of cables.

I. For the addition or relocation of outlets in existing construction where wall finishes will not be removed, provide “ring and string” consisting of two-gang ring and a pull string from the outlet, up through the wall and top track and into the accessible ceiling space. Provide a grommet at the top track penetration to protect the cable pull. In fire rated walls provide an enclosed “remodel” outlet box in addition to the ring noted above. In walls containing thermal or acoustical insulation, do not allow the installation of the pull string to displace the insulation.

J. In new construction or in areas where wall finishes must be removed for other reasons, or in areas with gypsum board ceilings, provide 4 inches square, deep box, two-gang ring, and 1-inch conduit stubbed out to the closest accessible ceiling space. Provide box hanger to span (2) studs. Secure at each stud with sheet metal screws. Secure box to hanger with (2) 1/4" - 20x3/8" long.

K. Bundle and tag the cabling for each system.

END OF SECTION

SECTION 26 05 34
CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A. This section describes requirements for conduit raceways.

1.02 RELATED WORK

A. Section 26 01 00: General Requirements for Electrical Work.

B. Section 26 05 26: Grounding and Bonding.

C. Section 26 05 02: Supporting from Building Structure

D. Section 26 05 29: Hangers and Supports for Electrical Systems

E. Section 27 10 05: Structured Cabling for Voice and Data

1.03 REFERENCE STANDARDS

A. American National Standards Institute (ANSI):
   1. C80.1 Specification for Rigid Steel Conduit, Zinc Coated
   2. C80.3 Specification for Electrical Metallic Tubing, Zinc Coated

B. National Electrical Manufacturers Association (NEMA):
   1. TC 2 Electrical Plastic Tubing (EPT), Conduit (EPC-40 and EPC-80) and Fittings

C. Underwriters Laboratories, Inc. (UL):
   1. 1242 Intermediate Metal Conduit

D. Federal Specifications:
   1. WW-C-581E Conduit, Metal Electrical Conduit. Steel, Zinc Coated

1.04 SUBMITTALS

A. Provide submittals for items listed documenting compliance with specification requirements.
   1. Product Data.
   2. Electrical Materials: Manufacturer’s current published catalog sheets.

PART 2 PRODUCTS

2.01 RACEWAYS

A. Rigid Steel Conduit:
   1. ANSI C80.1, minimum size 3/4 inch.
   2. Threaded fittings, galvanized.
   3. Locknuts, 3/4 inch to 1-1/2-inch, heavy nut steel.
   4. Locknuts, 1-1/2 inch and larger, malleable iron.
   5. Insulated bushings, malleable iron, plastic or nylon insert, OZ "IBC" series, Efcor "56" series, Appleton "GIB" series or equal.
   6. Three-piece conduit couplings, malleable iron, T & B "Erickson", Appleton "EC" series, OZ "4" series, or equal.

B. Intermediate Metal Conduit (IMC):
   1. Conform to UL 1242 and Federal Specification WW-C-581E, minimum size 3/4 inch.
   2. Fittings: As specified for rigid steel conduit.

C. Electrical Metallic Tubing (EMT):
   1. Galvanized rolled steel ANSI C80.3.
   2. Fittings to 2-inch, rain-tight compression gland, steel, plated with zinc or cadmium, for wet locations and setscrew steel for dry locations.
   3. Couplings, to 2-inch:
      a. Compression type: OZ "6050S" series, T & B "5120" series, Efcor "760" series, or equal.

b. Setscrew type: OZ "5050S" series, Steel City "TK121" series, Efcor "730" series, or equal.

4. Connectors, insulated throat:
   a. Compression type: OZ "7050 ST" series, T & B "5123" series, Efcor "750B" Series, or equal.
   b. Setscrew type: OZ "4050 ST" series, Steel City "TC721" series, Efcor "720B" Series, or equal.
5. Couplings, 2-1/2 inch to 4-inch, set-screw, four screw, steel plated with zinc or cadmium, OZ "5250S" series, T & B "5042" series, Efcor "736" series, or equal.
6. Connectors, 2-1/2 inch to 4-inch, insulated throat, set-screw, two screw, plated with zinc or cadmium, Appleton "TW250 SI" series, Efcor "726B" series, or equal.
7. Adapter, EMT to rigid steel, zinc or cadmium plated malleable iron, OZ, T & B, Efcor, or equal.
8. Maximum size, 2 inch, except for Telephone, 4 inch.

D. Flexible Metal Conduit:
1. Fabricate from galvanized steel strip, minimum size 1/2 inch.
2. Connectors, T & B "Tite Bite", with insulated throat, or equal.
3. Length, no greater than 6 feet. Allow slack for movement of connected equipment.

E. Liquid-tight Flexible Metal Conduit:
1. Fabricate from galvanized steel strip, jacketed with PVC, minimum size 1/2 inch.
2. Straight connectors, cadmium plated steel or malleable iron, insulated throat and neoprene sealing ring, OZ "4Q-IT" series, T & B "5330" series, Efcor "11-B" series, or equal.
3. Angle connectors, cadmium plated steel or malleable iron, insulated throat and neoprene sealing ring, OZ, T & B, Efcor, or equal, comparable to straight connectors.
4. Hardware, cadmium plated steel.
5. Length, no greater than 6 feet. Allow slack for movement of connected equipment.

F. PVC Conduit:
1. Schedule 40, NEMA TC2, Type II underground installation.
   a. Minimum size, 1 inch.
   b. Elbows, Schedule 40, encased in concrete for sizes 2-inch and larger.
   c. Extensions above grade, rigid steel (exposed), EMT (concealed indoors).
   d. Adapters, PVC to rigid steel, threaded plastic.
2. Schedule 80, NEMA TC2, Type II underground installations for emergency circuits.
   a. Minimum size, 1 inch.
   b. Extensions above grade, rigid steel (exposed), EMT (concealed indoors).
   c. Adapters, PVC to rigid steel, threaded plastic.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install conduit in a neat and workmanlike manner in accordance with NECA 1.

C. All conduit shall be concealed except in crawl spaces, utility tunnels, gantries, shafts, equipment rooms and where required to connect to surface mounted electrical equipment and free-standing equipment, or as noted otherwise or as instructed by the engineer.

D. Conduit Support:
1. Secure and support conduits in accordance with CEC and Section 26 05 29 using suitable supports and methods approved by the authority having jurisdiction.
2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

E. Connections and Terminations:
1. Use suitable adapters where required to transition from one type of conduit to another.

2. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
3. Secure joints and connections to provide maximum mechanical strength and electrical continuity.

F. Penetrations:
1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
2. Make penetrations perpendicular to surfaces unless otherwise indicated.
3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
4. Conceal bends for conduit risers emerging above ground.
5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.
6. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
7. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty. Include proposed locations of penetrations and methods for sealing with submittals.
8. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.

G. Conduit Movement Provisions: Where conduits are subject to thermal expansion, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. Where conduits are subject to seismic movement, provide 6 feet max. flex conduit with grounding fittings on each end bonded with #6 green wire. This includes, but is not limited to:
1. Where conduits cross structural joints intended for expansion, contraction, or deflection (seismic expansion joint).

H. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:
1. Where conduits pass from outdoors into conditioned interior spaces.
2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.

I. Provide grounding and bonding in accordance with Section 26 05 26.

J. Hazardous (Classified) Locations: Where conduits cross boundaries of hazardous (classified) locations, provide sealing fittings located as indicated or in accordance with CEC.

3.02 ABOVE GROUND RACEWAY SYSTEMS

A. Install all wiring in raceways. Install raceway systems, including conduits, hangers and support channels parallel or perpendicular to structural members in accordance with Section 26 05 29 Hangers and 260502 Support. Coordinate location of raceway systems with other Divisions prior to commencing installation.

B. Rigid Steel Conduit: Suitable for use in all locations.

C. Intermediate Metal Conduit: As specified for rigid steel.

D. Electrical Metallic Tubing: Suitable for use in concealed dry locations, not in concrete, masonry, or underground, and suitable exposed, minimum 8 feet above finished floor.

E. Flexible Metal Conduit: Suitable for connection of recessed lighting fixtures, motors or other devices requiring flexible connections in dry locations.

F. Liquid-Tight Flexible Metal Conduit: Suitable for connection of motors and equipment in damp or wet locations.

G. Conduit Supports:
   1. Support all conduits at intervals per Chapter 3 of the CEC for the selected raceway type (not to exceed 10-feet).
   2. Support individual conduits with conduit hangers or clamp back and nest back, if required for entrance into the equipment.
   3. Support multiple conduits, 2 or more in parallel, with framing channel and pipe clamps.
   4. Spring steel fasteners may be used to fasten electrical metallic tubing to individual hanger wires, minimum #12 AWG, specifically used for hanging conduit, nothing else.

H. Conduit Bends:
   1. Provide no more than (3) 90-degree conduit bends or the equivalent number of smaller radius bends in any conduit run between boxes or equipment.
   2. Length of run: 400-feet maximum less 100-feet for each equivalent 90-degree bend.
   3. Fabricate bends and offsets with a hickey or conduit bender designed specifically for use with the type of conduit to be bent, or use factory made bend.
   4. Radius of Bends: Conduits 2" inside diameter or less the inside bend radius shall be at least 6 times the diameter. Conduits greater than 2" diameter the inside bend radius shall be at least 10 times the conduit diameter.

I. Cap conduits during construction to prevent entrance of foreign material.

J. Provide conduit-sealing bushings at conduit penetrations through exterior walls to seal against fluid and gas pressure around the conduit.

K. Fit all conduits that enter the enclosure of a switchboard, distribution panel, or motor control center with an insulated grounding bushing.

L. Install pull ropes in all empty conduits, #12 AWG in conduits 1 inch and smaller and 3/16-inch polypropylene rope in conduits 1-1/4 inch and larger.

3.03 UNDERGROUND RACEWAY SYSTEMS

A. Install all wiring in raceways. Coordinate location of raceway systems with other Divisions prior to commencing installation. Provide excavation, clearances from other utilities, encasing, trenching, boring, backfill, compaction, patching, per Division 31 Site Preparation. Provide conduits per drawings.

B. EXCAVATING AND BACKFILLING
   1. Excavate and backfill as required for installation of electrical work. Maintain all warning signs, barricades, flares and lanterns as required by the Safety Orders and local ordinances.
   2. Excavation: Dig trenches straight and true to line and grade, with bottom clear of any rock points. Support conduit for entire length on undisturbed original earth. Backfill: All backfill material shall be local material free of rubble, rubbish or vegetation. Trenches shall be backfilled and compacted to 90% of maximum dry density at optimum moisture content in layers not to exceed 6" when compacted.
   3. Minimum Coverage (depth) - Per CEC Table 300.5
   4. Area of Influence- Do not install conduits parallel to building footings in the area of influence. See structural drawings and specifications for the area of influence and the methods that conduits can cross a footing.
   5. Drain Slope- Underground conduit shall be installed such that a .125" per foot min. slope exists at all points of the run to allow drainange and prevent the accumulation of water. Provide a drain slope of greater than .125" per foot when extending conduit away from a building.
   6. Provide underground warning tape along entire conduit length.

C. RESTORATION OF EXISTING IMPROVEMENTS
   1. Selective site demolition to provide all new utilities and utility connections, including all existing improvement removal; and all improvement restoration work.
   2. Utility paths are shown diagrammatically on Plans, and it is the Contractor's responsibility to determine the actual routes.

D. CUTTING AND PATCHING
   1. Provide necessary cutting and patching required to accomplish the work of Division underground 26. Restore all surfaces, roadways, sod, walks, curbs, walls, existing underground installation, etc., cut by installations to original condition in an acceptable manner.

E. Conduit Bends:
   1. Provide no more than (3) 90-degree conduit bends or the equivalent number of smaller radius bends in any conduit run between boxes or equipment.
   2. Length of run: 400-feet maximum less 100-feet for each equivalent 90-degree bend.
   3. Fabricate bends and offsets with a hickey or conduit bender designed specifically for use with the type of conduit to be bent, or use factory made bend.
   4. Radius of Bends: Conduits 2" inside diameter or less the inside bend radius shall be at least 6 times the diameter. Conduits greater than 2" diameter the inside bend radius shall be at least 10 times the conduit diameter.
   5. Radius of Bends for tele/data conduits: Conduits inside bend radius shall be at least 20 times the conduit diameter.

F. CONCRETE DUCT BANK CONSTRUCTION
   1. Provide plastic spacers at maximum 5'-0" centers to maintain 3" spacing between conduits.
   2. Drive two reinforcing bars to anchor the conduits at 10'-0" centers to prevent floating during concrete pour.
   3. Provide 3" wide yellow “Electric Line”, T& B, Westline or equal plastic warning tape 18" above duct bank.
   4. Provide one warning tape for each 12" width of concrete duct bank or fraction thereof. Minimum ground
   5. Cover for concrete duct bank shall be 2'-6".

G. Rigid Steel Conduit: Suitable for use in all locations. Where used underground, wrap with no less than 2 layers of half-lapped 10 mil vinyl pipe wrapping tape, Manville, Minnesota Mining

H. PVC Conduit: Suitable for use underground, with a minimum of 18 inches of cover. Also suitable for use in concrete slabs. Fabricate field bends with an approved thermal bender and jig. Maintain separation between conduits using plastic spacers specifically designed for the purpose.

I. Provide conduit-sealing bushings at conduit penetrations through exterior walls to seal against fluid and gas pressure around the conduit. Ducts shall be sealed to resist liquid and gas infiltration at all maintenance holes and building entrances.

J. Install pull ropes in all empty conduits, #12 AWG in conduits 1 inch and smaller and 3/16-inch polypropylene rope in conduits 1-1/4 inch and larger.

K. Fit PVC conduits that enter pullboxes and junction boxes with belled ends.

END OF SECTION

This page intentionally left blank

SECTION 26 05 36
CABLE TRAYS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Cable Tray.
   2. Attachment and Accessories.
   3. Supports

1.02 RELATED REQUIEMENTS

A. Section 26 01 00: General Requirements for Electrical Work.

1.03 REFERENCE STANDARDS

A. Underwriters Laboratories, Inc. (UL).

B. National Electrical Manufacturer's Association (NEMA).

C. American Society for Testing Materials (ASTM).

1.04 SUBMITTALS

A. Shop Drawings:
   1. Submit in accordance with Division 1.
   2. Provide layout plans, product information describing all parts and accessories. Provide loading and deflection tables. Show structure, ductwork, and piping on shop drawings to confirm field installation coordination.

PART 2 PRODUCTS

2.01 CABLE TRAY SYSTEM - GENERAL REQUIREMENTS

A. Provide new cable tray system consisting of all required components, fittings, supports, accessories, etc. as necessary for a complete system.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Do not use cable tray for applications other than as permitted by NFPA 70 and product listing/classification.

D. Provide cable tray system and associated components suitable for use at indicated span/load ratings under the service conditions at the installed location.

E. Unless otherwise indicated, specified span/load ratings are according to NEMA VE 1 (metal cable tray systems) or NEMA FG 1 (fiberglass cable tray systems) with safety factor of 1.5 and working load only (no additional concentrated static load).

F. Unless otherwise indicated, specified load/fill depths and inside widths are nominal values according to NEMA VE 1 (metal cable tray systems) or NEMA FG 1 (fiberglass cable tray systems) with applicable allowable tolerances.

2.02 ACCEPTABLE MANUFACTURERS

A. B-Line,

B. Husky,

C. Cope,

D. or equal.

2.03 CABLE TRAY

A. Provide a complete cable tray system including all necessary hardware, horizontal bend fittings, vertical inside and outside bend fittings, tees, crosses, offsets, splice plates, blind end plates, hanger rods and clamps and support hanger brackets as required, and as shown on plans.

Vertical and horizontal offsets shall be provided as necessary to coordinate with the mechanical and structural installation.

B. Systems shall meet NEMA 12A and have a loading depth of 4 inches. All trays will support without collapse 200 pounds over and above allowable load. Tray and fittings shall be manufactured of pregalvanized steel. Transverse members shall be welded to the side rail. No part of the cable tray shall protrude below the bottom of the side rail.

C. Trays shall be 6, 9, 12, 18 or 24 inches wide as indicated on plans. Tray shall be furnished in standard 12 feet lengths.

2.04 CABLE TRAY SUPPORTS

A. Provide two support rods every 8 feet or wall bracket support where applicable. Rod support shall be 1/2-inch minimum threaded steel rod firmly attached to structure by beam clamps, swivel joints, concrete anchors, or concrete inserts. Installation shall comply with all applicable seismic requirements.

2.05 CABLE TRAY ATTACHMENTS AND ACCESSORIES

A. Provide all cable tray accessories required for a complete installation. Accessories shall include, bonding jumpers at joints, dropout cable exits and conduit clamps where conduit terminates at the cable tray.

2.06 FIRE BARRIERS

A. Provide cable tray fire barriers at all points where the cable tray penetrates a fire barrier wall or floor as specified in Division 7 Firestopping. The F rating shall apply to all through penetrations and shall not be less than the required fire-resistance rating of the assembly penetrated. The T rating shall apply to all walls requiring protected openings as defined by Title 24, California Building Standards Code (CBC) 709 and 710.

PART 3 EXECUTION

3.01 INSTALLATION

A. Assemble and install all cable tray components to form a complete system. All components shall be by the same manufacturer. Field modify cable tray to accommodate any structure or mechanical conflicts. Modifications shall be made with cable tray Manufacturer's UL listed components only.

B. Install all joints and connections using bolted plates. Install a bonding wire at all connections to assure electrical continuity. The cable tray system shall be bonded at all service points.

C. Secure cables installed in cable tray to the tray with plenum rated tie wrap every 2 feet. Bundle each system’s cabling independently and tag each bundle.

D. Bracket all branch conduits to the cable tray system using conduit clamps and brackets. Ensure continuous grounding systems per California Electrical Code (CEC) requirements.

E. Install expansion joints in the cable tray system at all building expansion joints.

F. Cable tray drop out plates at all points where cable drops out of the bottom of the cable tray.

G. All applicable seismic requirements shall be met. Refer Section 16012 - Seismic Requirements of these specifications.

H. Field modify cable tray to avoid conflicts with mechanical duct work, piping or structural elements. Modifications shall be made with cable tray Manufacturer's UL listed components only.

I. Install cable tray at 7 feet-2 inches AFF in equipment rooms.

J. All cables installed within the cable tray system shall be type PLTC (power-limited tray cable).

END OF SECTION

SECTION 26 05 37
BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A. Provide electrical materials, installation and testing for the project improvements.

1.02 DESCRIPTION

A. This section describes requirements for outlet boxes.

1.03 RELATED WORK

A. Section 26 01 00: General Requirements for Electrical Work.

1.04 REFERENCE STANDARDS

A. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; National Electrical Manufacturers Association; 2007.

B. NEMA OS 1 - Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; National Electrical Manufacturers Association; 2008.

C. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports; National Electrical Manufacturers Association; 2008.

D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); National Electrical Manufacturers Association; 2008.

1.05 SUBMITTALS

A. Provide submittals for items listed documenting compliance with specification requirements.

B. Product Data:
   1. Electrical Materials: Manufacturer’s current published catalog sheets.

PART 2 PRODUCTS

2.01 BOXES

A. General Requirements:
   1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
   2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
   3. Provide products listed, classified, and labeled as suitable for the purpose intended.
   4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
   5. Provide grounding terminals within boxes where equipment grounding conductors terminate.

B. Outlet and Device Boxes Up to 100 cubic inches (1,650 cu cm), Including Those Used as Junction and Pull Boxes:
   1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
   2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
   3. Use suitable concrete type boxes where flush-mounted in concrete.
   4. Use suitable masonry type boxes where flush-mounted in masonry walls.
   5. Use raised covers suitable for the type of wall construction and device configuration where required.
   6. Use shallow boxes where required by the type of wall construction.
   7. Do not use "through-wall" boxes designed for access from both sides of wall.
   8. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.

9. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
10. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
11. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
12. Wall Plates: Comply with Section 26 27 26.

C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
2. NEMA 250 Environment Type, Unless Otherwise Indicated:
3. Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.

D. Cast Boxes: NEMA FB 1, Type FD, cast feralloy. Provide gasketed cover by box manufacturer. Provide threaded hubs.

2.02 OUTLET BOXES

A. Construction: Deep drawn or fabricated interlocked flat pieces with welded tabs, electro-galvanized sheet steel with electro-galvanized hardware. Do not use sectional boxes.

B. Size: To accommodate the required number and sizes of conduits, wires, splices and devices but not smaller than the size indicated or specified.

C. Plaster Ring: Provide flush with wall or ceiling finish, except where otherwise indicated or specified.

D. Device Boxes: For single switches and receptacles, provide boxes not less than 4 inches square by 1-1/2 inches deep. For 2 devices, provide boxes not less than 4-11/16 inches square by 1-1/2 inches deep.

E. Telecommunications Boxes: No less than 4-11/16 inches square by 2 inches deep.

F. Special Mounting: In cabinets, tile, concrete block, brick, stone, wood or similar material, provide rectangular boxes with square corners and straight sides. For single devices, provide boxes 4 inches high by 2-1/2 inches wide by 3-3/8 inches deep. For 2 or more devices, provide multi-gang, non-sectional box with tile or masonry ring.

G. Lighting Fixtures: 4-inch octagon by 2-1/8-inch-deep, minimum. Fit boxes for surface or pendant mounted fixtures with 3/8-inch malleable iron fixture stud.

H. Attach device boxes with adjustable bar type hangers screw fastened to two stud/ceiling joists on both sides of box.

2.03 PULL AND JUNCTION BOXES

A. General: For all pull and junction boxes over 300 cubic inches, provide code gauge, sheet steel boxes which meet NEMA 1 standards for panelboard and terminal cabinet box construction, with screw type covers.

B. Ground Lug: Weld, before finish is applied, a grounding pad drilled for two bolted grounding lugs or two ground studs on the box interior.

C. Finish: Apply rust inhibiting prime coat and 2 coats of baked enamel, standard factory gray.

D. Hardware: Cadmium plated steel screws.

2.04 PRECAST CONCRETE BOXES

A. Provide high-density reinforced concrete pull and junction boxes with end and side knockouts as manufactured by Christy, Forni, Brooks, or approved equal. Fabricated boxes with non-settling shoulders to facilitate maintaining grade during backfilling. Unless noted otherwise, provide galvanized steel checker plate covers with hold-down bolts, identified as follows:

1. System Identification
2. Power - 600 volts or less Electrical
3. Power - 2300 volts Electrical (Provide high voltage warning sign per Title 8)

PART 3 EXECUTION

3.01 BOXES AND CABINETS

A. Place outlet boxes in a location as close to that shown on the plans as possible. Coordinate location of boxes with other Divisions.

B. Install wall mounted outlet boxes so that the distance from the centerline of the box to finished floor is as listed or indicated:
   1. Receptacles, + 1 foot-6 inches
   2. Telephone, + 1 foot-6 inches
   3. Data, + 1 foot-6 inches
   4. Switches, + 4 feet-0 inches

C. Install junction boxes with covers in concealed areas accessible after installation. Do not install junction boxes flush with finish walls or ceilings unless specifically approved by the Engineer.

D. Attach surface boxes with:
   1. Steel or malleable iron expansion anchors in concrete or solid masonry.
   2. Wood screws in wood.
   3. Toggle bolts in hollow walls or masonry.
   4. Machine screws, bolts or welded studs in steel.

E. Attach flush boxes with adjustable bar type hangers screw fastened to studs on both sides of the box.

END OF SECTION

This page intentionally left blank

SECTION 26 05 53
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 DESCRIPTION

A. Extent of electrical identification work is as outlined by this specification.

B. Types of electrical identification work specified in this section include the following:
   1. Buried cable warnings.
   2. Electrical power, control and communication conductors.
   3. Operational instructions and warnings.
   4. Danger signs.
   5. Equipment/system identification signs.

C. Submit complete schedule with the shop drawings listing all nameplates and information contained thereon.

1.02 RELATED REQUIREMENTS

A. Section 26 0100: General Requirements for Electrical Work.

1.03 QUALITY ASSURANCE

A. California Electrical Code (CEC) Compliance: Comply with CEC as applicable to installation of identifying labels and markers for wiring and equipment.

B. Underwriters Laboratories, Inc. (UL) Compliance: Comply with applicable requirements of UL Standard 969, "Marking and Labeling Systems", pertaining to electrical identification systems.

C. American National Standards Institute (ANSI) Compliance: Comply with applicable requirements of ANSI Standard A13.1, "Scheme for the Identification of Piping Systems".

D. National Electrical Manufacturer's Association (NEMA) Compliance: Comply with applicable requirements of NEMA Standard No's WC-1 and WC-2 pertaining to identification of power and control conductors.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's data on electrical identification materials and products.

B. Samples: Submit samples of each color, lettering style and other graphic representation required for each identification material or system.

PART 2 PRODUCTS

2.01 IDENTIFICATION REQUIREMENTS

A. Identification for Equipment:
   1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
   2. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70, including but not limited to the following.
      a. Service equipment.
      b. Industrial control panels.
      c. Motor control centers.
      d. Elevator control panels.
      e. Industrial machinery.

B. Identification for Conductors and Cables:
   1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26 0519.
   2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.

2.02 WARNING SIGNS AND LABELS

A. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.

B. Warning Signs:
   1. Materials:
   2. Minimum Size: 7 by 10 inches (178 by 254 mm) unless otherwise indicated.

C. Warning Labels:
   1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
   2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
   3. Minimum Size: 2 by 4 inches (51 mm by 102 mm) unless otherwise indicated.

2.03 ACCEPTABLE MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide electrical identification products of one of the following (for each type marker):
   1. Almetek,
   2. Brady, W.H. Company,
   3. Calipico Inc.,
   4. Cole-Flex Corporation,
   5. Direct Safety Company,
   6. George-Ingraham Corporation,
   7. Griffolyn Company,
   8. Ideal Industries, Inc.,
   9. LEM Products, Inc.,
   10. Markal Company,
   11. National Band and Tag Company,
   12. Panduit Corporation,
   13. Seton Name Plate Company,
   14. Tesa Corporation,
   15. Or equal.

2.04 ELECTRICAL IDENTIFICATION MATERIALS

A. Except as otherwise indicated, provide manufacturer's standard products of categories and types required for each application. Where more than single type is specified for an application, provide single selection for each application.

B. Color-Coded Plastic Tape:
   1. Provide manufacturer's standard self-adhesive vinyl tape not less than 3 mils thick by 1-1/2 inches wide.
      a. Colors: Unless otherwise indicated or required by governing regulations, provide orange tape.

C. Underground-Type Plastic Line Marker:
   1. Manufacturer's standard permanent, bright-colored, continuous-printed plastic tape, intended for direct-burial service; not less than 6 inches wide x 4 mils thick. Provide tape with printing which most accurately indicates type of service of buried cable.

D. Cable/Conductor Identification Bands:
   1. Provide manufacturer's standard vinyl-cloth self-adhesive cable/conductor markers of wrap-around type, either pre-numbered plastic coated type, or write-on type with clear plastic self-adhesive cover flap; numbered to show circuit identification.

E. Plasticized Tags:
   1. Manufacturer's standard pre-printed or partially pre-printed accident-prevention and operational tags, of plasticized card stock with matte finish suitable for writing, approximately 3-1/4 x 5-5/8 inches, with brass grommets and wire fasteners, and with appropriate pre-printed wording including large-size primary wording, e.g., DANGER, CAUTION, DO NOT OPERATE.

F. Self-Adhesive Plastic Signs:
   1. Provide manufacturer's standard, self-adhesive or pressure-sensitive, pre-printed, flexible vinyl signs for operational instructions or warnings; of sizes suitable for application areas and adequate for visibility, with proper wording for each application, e.g., 208V, EXHAUST FAN, RECTIFIER.

G. Colors: Unless otherwise indicated, or required by governing regulations, provide white signs with black lettering.

H. Baked Enamel Danger Signs:
   1. General: Provide manufacturer's standard DANGER signs of baked enamel finish on 20-gauge steel; of standard red, black and white graphics; 14 x 10 inches size except where 10 x 7 inches is the largest size which can be applied where needed, and except where larger size is needed for adequate vision; with recognized standard explanation wording, e.g., HIGH VOLTAGE, KEEP AWAY, BURIED CABLE, DO NOT TOUCH SWITCH.

I. Engraved Plastic-Laminate Signs:
   1. Provide engraving stock melamine plastic laminate, complying with FS L-P-387, in sizes and thicknesses indicated, engraved with engraver's standard letter style of sizes and wording indicated, black face and white core plies (letter color) except as otherwise indicated, punched for mechanical fastening except where adhesive mounting is necessary because of substrate.
   2. Thickness: 1/8 inch, except as otherwise indicated.
   3. Fasteners: Self-tapping stainless steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate substrate.

2.05 LETTERING AND GRAPHICS

A. General: Coordinate names, abbreviations and other designations used in electrical identification work, with corresponding designations shown, specified or scheduled. Provide numbers, lettering and wording as indicated or, if not otherwise indicated, as recommended by manufacturer or as required for proper identification and operation/maintenance of electrical systems and equipment. Comply with ANSI A13.1 pertaining to minimum sizes for letters and numbers.

PART 3 EXECUTION

3.01 APPLICATION AND INSTALLATION

A. General Installation Requirements:
   1. Install electrical identification products as indicated, in accordance with manufacturer's written instructions, and requirements of CEC and OSHA.
   2. Coordination: Where identification is to be applied to surfaces which require finish, install identification after completion of painting.
   3. Regulations: Comply with governing regulations and requests of governing authorities for identification of electrical work.

B. Conduit Identification:
   1. Where electrical conduit is exposed in spaces with exposed mechanical piping, which is identified by color-coded method, apply color-coded identification on electrical conduit in manner similar to piping identification. Except as otherwise indicated use white as coded color for conduit.

C. Box Identification:
   1. After completion, using an indelible wide tip marker, indicate on the cover of each junction and pull box the designation of the circuits contained therein, i.e., A-1, 3, 5. Use a black marker for normal power circuits a red marker for critical circuits, an orange marker for life safety circuits, and a green marker for equipment circuits.
   2. All junction and pull boxes for wiring systems above 600V shall be identified with high voltage warning labels installed every 20 linear feet in accordance with OSHA standards. All boxes shall also be painted red, see Section 09900 of the specifications.
   3. All junction and pull boxes for the fire alarm system shall be painted red. All raceway for the fire alarm system shall be labeled "Fire Alarm" in red letters on intervals not to exceed ten feet.

D. Underground Cable Identification:
   1. During back-filling/top-soiling of each exterior underground electrical, signal or communication conduits, install continuous underground-type plastic line marker, located directly over buried line at 6 to 8 inches below finished grade. Where multiple small lines are buried in a common trench and do not exceed an overall width of 16 inches, install a single line marker.
   2. Install line marker for every buried conduit.

E. Cable/Conductor Identification:
   1. Apply cable/conductor identification, including voltage, phase and feeder number, on each cable/conductor in each box/enclosure/cabinet where wires of more than one circuit or communication/signal system are present, except where another form of identification (such as color-coded conductors) is provided. Match identification with marking system used in panelboards, shop drawings, contract documents, and similar previously established identification for project's electrical work. Refer to Section 16100 - Basic Materials and Methods of these specifications for color coding requirements.

F. Operational Identification and Warnings:
   1. Wherever required by OSHA or directed by the Owner’s Representative, to ensure safe and efficient operation and maintenance of electrical systems, including prevention of misuse of electrical facilities equipment by unauthorized personnel, install self-adhesive plastic signs or similar equivalent identification, instruction or warnings on switches, outlets and other controls, devices and covers of electrical enclosures. Where detailed instructions or explanations are needed, provide plasticized tags with clearly written messages adequate for intended purposed. Request a meeting with the Owner’s Representative prior to substantial completion to coordinate warning requirements.

G. Danger Signs:
   1. In addition to installation of danger signs required by governing regulations and authorities, install appropriate danger signs at locations identified by the Owner’s Representative as constituting similar dangers for persons in or about project. Request a meeting with the Owner’s Representative prior to substantial completion to coordinate danger sign requirements.
      a. High Voltage: Install danger signs wherever it is possible, under any circumstances, for persons to come into contact with electrical power of voltages higher than 110-120 volts.
      b. Critical Switches/Controls: Install danger signs on switches and similar controls, regardless of whether concealed or locked up, where untimely or inadvertent operation (by anyone) could result in significant danger to persons, or damage to or loss of property.

H. Equipment/System Identification:
   1. Install engraved plastic-laminate sign on each major unit of electrical equipment in building; including central or master unit of each electrical system including communication/control/signal systems, unless unit is specified with its own self-explanatory identification or signal system. Except as otherwise indicated, provide single line of text, 1/2-inch-high lettering, on 1-1/2 inch high sign (2 inch high where 2 lines are required), white lettering in black field. Provide text matching terminology and numbering of the contract documents and shop drawings. Provide signs for each unit of the following categories of electrical work:
      a. Electrical cabinets and enclosures.
      b. Access panel/doors to electrical facilities.
      c. Transformers.
      d. Fire alarm control panel, battery cabinets, voice alarm system cabinets, and transponders.
   2. Install signs at locations indicated or, where not otherwise indicated, at location for best convenience of viewing without interference with operation and maintenance of equipment. Secure to substrate with fasteners, except use adhesive where fasteners should not or cannot penetrate substrate. Identification of flush mounted cabinets and panelboards shall be on the inside of the device.
   3. Panelboards, individually mounted circuit breakers, and each breaker in the switchboards, secondary unit substations, and distribution panels shall be identified with an engraved plastic laminate sign. Plastic nameplates shall be multicolored laminated plastic with faceplate and core as scheduled. Lettering shall be engraved minimum 1/4 inch high letters.
      a. 480/277 volt normal power equipment shall be identified with white faceplate with green core.
      b. 480/277 volt critical branch power equipment shall be identified with white faceplate with yellow core.
      c. 480/277 volt life safety branch power equipment shall be identified with white faceplate with red core.
      d. 480/277 volt equipment branch power equipment shall be identified with white faceplate with blue core.
      e. 208/120 volt normal power equipment shall be identified with green faceplate with white core.
      f. 208/120 volt critical branch power equipment shall be identified with yellow faceplate with white core.
      g. 208/120 volt life safety branch power equipment shall be identified with red faceplate with white core.
      h. 208/120 volt equipment branch power equipment shall be identified with blue faceplate with white core.
      i. Equipment identification is to indicate the following:
         1) Equipment ID abbreviation.
         2) Voltage, phase, wires and frequency.
         3) Emergency or other system.
         4) Power source origination.
         5) Example:
            (a) Panel GLSH1
            (b) 480/277V, 3 phase, 4 wire
            (c) Life Safety System
            (d) Fed by GLSD1

END OF SECTION

This page intentionally left blank

SECTION 26 05 74
ARC FLASH STUDY

PART 1 GENERAL

1.01 SUMMARY

A. The purpose of this study is to provide a complete arc flash program to protect individuals working on its premises from electrical arc flash hazards. These individuals may include any workers who inspect, maintain, or operate energized electrical equipment.

1.02 SCOPE

A. Engage and pay for the services of a recognized independent Testing laboratory/Firm for the purpose of performing inspections and tests as herein specified.

B. The Firm should be currently involved in high- and low-voltage power system evaluation. The study must be performed, stamped and signed by a registered professional engineer. Credentials of the individual(s) performing the study and background of the Firm must be submitted to the Engineer for approval prior to start of the work. A minimum of five (5) years' experience in power system analysis is required for the individual in charge of the project.

C. The Firm performing the study should demonstrate capability and experience to provide assistance during start up as required.

D. The Firm must provide all material, equipment, labor and technical supervision to perform such tests and inspections.

E. It is the intent of these tests to assure that all electrical equipment, both Contractor and Owner-supplied, is operational within industry and manufacturer's tolerances and is installed in accordance with design specifications.

1.03 RELATED REQUIREMENTS

A. Section 26 01 00: General Requirements for Electrical Work.

1.04 SAFETY AND PROCEDURAL REQUIREMENTS

A. The Firm must provide proof (written documentation) that its employees working on the premises have been properly trained in the use and application of personal protective equipment (PPE) and the hazards of working on or near energized equipment.

B. Safety practices that must be followed include, but are not limited to, the following:
   1. Occupational Safety and Health Act
   2. Accident Prevention Manual for Industrial Operations, National Safety Council
   3. Applicable state and local safety operating procedures
   4. Owner's safety practices

C. Perform all work in accordance with the applicable codes and standards of the following agencies except as provided otherwise herein:
   1. InterNational Electrical Testing Association – NETA ATS latest Edition: Acceptance Testing Specifications, and/or NETA MTS latest Edition: Maintenance Testing Specifications.
   2. National Fire Protection Association – NFPA
      a. ANSI/NFPA 70: National Electrical Code (NEC)
      b. ANSI/NFPA 70B: Recommended Practice for Electrical Equipment Maintenance
      c. NFPA 70E: Electrical Safety Requirements for Employee Workplaces

1.05 DATA COLLECTION FOR THE STUDY

A. The Contractor must provide the required data for preparation of the studies. The Firm performing the system studies must furnish the Contractor with a listing of the required data immediately after award of the contract.

B. The Firm must provide an up to date electrical system single-line diagram as required by NFPA 70E, 2009 Edition, “Standard for Electrical Safety in the Workplace”, as referenced in OSHA 29 CFR 1910 Subpart S, Appendix A. This information must include nameplate data for electrical components (e.g. transformers, medium voltage switchgear, panelboards, switchboards, motor control centers, etc.) for all portions of the electrical system from the utility intertie through the lowest rated panel.

C. Utilize up to date Cable sizes, types and lengths between electrical equipment components and utility source data for an accurate single-line representation of the electrical system. Utilize unique characteristics of the equipment installation which may impact the magnitude of the potential hazard (e.g. open space versus enclosure). Verify over-current device settings.

D. Data collection may require removal of barriers, opening of front panels, etc. while equipment is energized. The Firm must provide its own PPE protection with a minimum arc thermal performance rating (ATPV) of 40 calories/cm2.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 SYSTEM ANALYSIS

A. Perform a comprehensive analysis of the facility’s electrical system for all equipment 480 volt and higher and 240 volt served by a 125kVA or larger transformer based on the up to date single-line diagram provided from Part 1. Include the following:
   1. Short Circuit Study – Perform a short circuit analysis in accordance with ANSI standard C37 and IEEE standard 141-1993 (Red Book) for each electrical component as defined in “Section A. “
   2. Coordination Study – Perform a coordination study in accordance with IEEE 242-2001 “Buff” to determine the proper over-current device settings that will balance system reliability through selective coordination while minimizing the magnitude of an electrical arc flash hazard incident.
   3. Incident Energy Study – Perform an incident energy study in accordance with the IEEE 1584-2004a, ”IEEE Guide for Performing Arc Flash Hazard Calculations” as referenced in NFPA 70E, “Standard for Electrical Safety in the Workplace”, 2009 Revision, in order to quantify the hazard for selection of personal protective equipment (PPE). Tables that assume fault current levels and clearing time for proper PPE selection are not acceptable. Assist the Owner in selecting appropriate combinations of PPE prior to the final analysis and preparation of equipment labels.

3.02 DESIGN REVIEW

A. Assist the Owner with system design adjustments to optimize the results of the study as it relates to safety and reliable electrical system operation (e.g. overcurrent device settings, working distances, current limiting devices). This includes mitigation, where possible, of incident energy levels that exceed 40 calories/cm2. A qualified engineer with power systems design experience must provide this assistance.

3.03 STUDY REPORT

A. Provide a comprehensive report that includes:
   1. Report summary with analysis methodology, findings and recommendations
   2. Summary of input data for utility source, equipment and cables
   3. Available fault current at each equipment location with comparison to equipment rating
   4. Overcurrent device settings (e.g. pick-up, time delay, curve), “as found” and “as recommended”
   5. Incident energy level (calories/cm2) for each equipment location and recommended PPE
   6. Overcurrent device coordination curves including related section of the single-line diagram
   7. Complete system single-line diagram for the system analyzed

B. Labels
   1. Based on the results of the incident energy study, provide and install a warning label (orange <40 cal/cm2) or danger label (red > 40 cal/cm2) for each piece of equipment as specified in "Section A" in accordance with ANSI Z535.4-2002. The label must be readable in both indoor and outdoor environments for at least 3 years and contain the following information:
   2. Arc hazard boundary (inches)
   3. Working distance (inches)
      a. Arc flash incident energy at the working distance (calories/ cm2)
         1) PPE category and description including the glove rating
            (a) Voltage rating of the equipment
            (b) Limited approach distance (inches)
            (c) Restricted approach distance (inches)
            (d) Prohibited approach distance (inches)
            (e) Equipment/bus name
            (f) Date prepared
            (g) Supplier name and address

C. Equipment Verification/Operation
   1. The validity of the arc flash study and incident energy readings is in part based on proper setting of over-current device trip times and the proper operation of the over-current devices and breakers themselves. Verify proper operation of over-current devices and breakers at the request of the Owner using InterNational Electrical Testing Association (NETA) qualified technicians.
   2. The Firm must be capable of adjustment, maintenance, repair or replacement of over-current devices or breakers as required to support the performance of the electrical system in line with the expectations of the system study.

D. Safety Training
   1. Provide the Owner with one day of arc flash safety training that contains the requirements referenced in OSHA 1910.269, OSHA 1910 Subpart S and NFPA 70E including:
      a. Proper use of the system analysis data
      b. Interpretation of hazard labels
      c. Selection and utilization of personal protective equipment
      d. Safe work practices and procedures
   2. Provide the Owner an outline of the one-day training course including training materials at time of quotation. The Owner at its discretion may require additional training customized to its specific needs. The Firm must be capable of developing and presenting customized training for approval as required.
   3. Provide a training certificate to record satisfactory completion by the Owner's employees for continuing education credits and re-licensing requirements. Satisfactory competition is defined as the student obtaining a minimum of 70% on the post training examination and the ability to work safely if a hands-on performance evaluation is provided.

3.04 SAFETY DOCUMENTATION/POLICY

A. At the request of the Owner, integrate the results of the system study and design review into the safety manual in compliance with OSHA CFR 29 1910.333. Assist the Owner at its request to develop a safety policy with corresponding documentation and procedures including information gained in the system analysis. This includes electrical safety, procedures for mitigation of arc hazards, PPE selection based on specific equipment of the Owner, task and training requirements.

END OF SECTION

This page intentionally left blank

SECTION 26 08 00

COMMISSIONING OF ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 DESCRIPTION

A. The requirements of this Section apply to all sections of Division 26.

B. This project will have selected building systems commissioned. The complete list of equipment and systems to be commissioned is specified in Section 01 91 13 GENERAL COMMISSIONING REQUIREMENTS. The commissioning process, which the Contractor is responsible to execute, is defined in Section 01 91 13 GENERAL COMMISSIONING REQUIRMENTS. A Commissioning Agent (CxA) appointed by the OWNER will manage the commissioning process.

1.02 RELATED WORK

A. Section 01 91 13 GENERAL COMMISSIONING REQUIREMENTS.

1.03 SUMMARY

A. This Section includes requirements for commissioning the Facility electrical systems, related subsystems and related equipment. This Section supplements the general requirements specified in Section 01 91 13 General Commissioning Requirements.

B. Refer to Section 01 91 13 GENERAL COMMISSIONING REQUIREMENTS for more details regarding processes and procedures as well as roles and responsibilities for all Commissioning Team members.

1.04 DEFINITIONS

A. Refer to Section 01 91 13 GENERAL COMMISSIONING REQUIREMENTS for definitions.

1.05 COMMISSIONED SYSTEMS

A. Commissioning of a system or systems specified in Division 26 is part of the construction process. Documentation and testing of these systems, as well as training of the Owner's Operation and Maintenance personnel in accordance with the requirements of Section 01 91 13 and of Division 26, is required in cooperation with the Owner and the Commissioning Agent.

B. The Facility electrical systems commissioning will include the systems listed in Section 01 91 13 General Commissioning Requirements:

1.06 SUBMITTALS

A. The commissioning process requires review of selected Submittals that pertain to the systems to be commissioned. The Commissioning Agent will provide a list of submittals that will be reviewed by the Commissioning Agent. This list will be reviewed and approved by the Owner prior to forwarding to the Contractor. Refer to Section 01 for further details.

B. The commissioning process requires Submittal review simultaneously with engineering review. Specific submittal requirements related to the commissioning process are specified in Section 01 91 13 GENERAL COMMISSIONING REQUIREMENTS.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 CONSTRUCTION INSPECTIONS

A. Commissioning of Electrical systems will require inspection of individual elements of the electrical systems construction throughout the construction period. The Contractor shall coordinate with the Commissioning Agent in accordance with Section 01 91 13 and the Commissioning plan to schedule electrical systems inspections as required to support the Commissioning Process.

3.02 PRE-FUNCTIONAL CHECKLISTS

A. The Contractor shall complete Pre-Functional Checklists to verify systems, subsystems, and equipment installation is complete and systems are ready for Systems Functional Performance Testing. The Commissioning Agent will prepare Pre-Functional Checklists to be used to document equipment installation. The Contractor shall complete the checklists. Completed checklists shall be submitted to the Owner and to the Commissioning Agent for review. The Commissioning Agent may spot check a sample of completed checklists. If the Commissioning Agent determines that the information provided on the checklist is not accurate, the Commissioning Agent will return the marked-up checklist to the Contractor for correction and resubmission. If the Commissioning Agent determines that a significant number of completed checklists for similar equipment are not accurate, the Commissioning Agent will select a broader sample of checklists for review. If the Commissioning Agent determines that a significant number of the broader sample of checklists is also inaccurate, all the checklists for the type of equipment will be returned to the Contractor for correction and resubmission. Refer to SECTION 01 91 13 GENERAL COMMISSIONING REQUIREMENTS for submittal requirements for Pre-Functional Checklists, Equipment Startup Reports, and other commissioning documents.

3.03 CONTRACTORS TESTS

A. Contractor tests as required by other sections of Division 26 shall be scheduled and documented in accordance with Section 01 00 00 GENERAL REQUIREMENTS. All testing shall be incorporated into the project schedule. Contractor shall provide no less than 7 calendar days' notice of testing. The Commissioning Agent will witness selected Contractor tests at the sole discretion of the Commissioning Agent. Contractor tests shall be completed prior to scheduling Systems Functional Performance Testing.

3.04 SYSTEMS FUNCTIONAL PERFORMANCE TESTING

A. The Commissioning Process includes Systems Functional Performance Testing that is intended to test systems functional performance under steady state conditions, to test system reaction to changes in operating conditions, and system performance under emergency conditions. The Commissioning Agent will prepare detailed Systems Functional Performance Test procedures for review and approval by the Resident Engineer. The Contractor shall review and comment on the tests prior to approval. The Contractor shall provide the required labor, materials, and test equipment identified in the test procedure to perform the tests. The Commissioning Agent will witness and document the testing. The Contractor shall sign the test reports to verify tests were performed. See Section 01 91 13 GENERAL COMMISSIONING REQUIREMENTS, for additional details.

3.05 TRAINING OF OWNER PERSONNEL

A. Training of the Owner operation and maintenance personnel is required in cooperation with the Resident Engineer and Commissioning Agent. Provide competent, factory authorized personnel to provide instruction to operation and maintenance personnel concerning the location, operation, and troubleshooting of the installed systems. Contractor shall submit training agendas and trainer resumes in accordance with the requirements of Section 01 91 13. The instruction shall be scheduled in coordination with the Owner Resident Engineer after submission and approval of formal training plans. Refer to Section 01 91 13 GENERAL COMMISSIONING REQUIREMENTS and Division 26 Sections for additional Contractor training requirements.

END OF SECTION

SECTION 26 08 01
ELECTRICAL ACCEPTANCE TESTING

PART 1 GENERAL

1.01 DESCRIPTION

A. The work required under this section of the specifications consists of the electrical acceptance testing and inspections for all electrical systems and equipment installed or affected by this project. The Contractor shall prepare and submit to the Owner for review and approval acceptance test procedures and inspection forms in accordance with this specification. A complete functional acceptance test shall be performed on all electrical systems and equipment to prove they perform as intended under all modes of operation. Testing specified in other sections is in addition to testing specified herein. Also the testing will demonstrate the electrical system and equipment operation to the Owner. All labor, materials, rentals, permits and testing equipment or other which is required shall be provided by the Contractor.

1.02 GENERAL

A. The Contractor shall prepare and submit to the Owner for review and approval acceptance test procedures and inspection forms in accordance with this specification. Testing shall be performed by the Contractor, the manufacturer's representative, and/or a International Electrical Testing Association (NETA) testing company depending on the type of equipment or system being tested as follows:
   1. CONTRACTOR
      a. Cables, Low-Voltage, 600-Volt Maximum
      b. Switches and Circuit Breakers, Air, Low-Voltage
      c. Fiber Optic Cable
      d. Lighting System, Lighting Control System
      e. Telecommunications System
      f. Grounding System
      g. Low Voltage (600 VAC maximum) Power Distribution System
   2. MANUFACTURER'S REPRESENTATIVE
      a. Fire Alarm System
      b. Building Management System
   3. NETA
      a. Switchgear and Switchboard Assemblies (480VAC, 1000A or greater)
      b. Ground Fault Protection System
      c. Power Demand Load Recording Ammeter Readings
      d. Network Protectors, 600-Volt Class
      e. Switchgear and Switchboard Assemblies
      f. Switches, Cutouts
      g. Circuit Breakers
      h. Circuit Switchers
      i. Protective Relays
      j. Instrument Transformers
      k. Metering Devices

B. The Contractor shall prepare the test procedures and inspection forms and perform the specified testing and inspections, for the assigned equipment and systems above, as applicable to the equipment and systems installed or affected by the project. If the Contractor does not have the ability or qualifications to conduct the required tests then the Contractor will sub contract with a testing organization who does.

C. The Contractor shall engage in and pay for the services of the Manufacturer's Representative approved testing organizations to provide testing and inspection of the applicable electrical equipment and systems as listed above and specified in this section. The testing organizations may be an independent division or authorized representative of the manufacturer of the assembled products being tested. The Manufacturer's Representative will conduct startup testing and will be part of integrated system testing. If an outside testing organization is approved, a representative of the manufacturer shall be under contract by the testing company. The representative shall be present during all testing to ensure that the testing is performed properly and that any deficiencies discovered are promptly corrected. The Manufacturer's Representative will assist in the preparation and performance of other test procedures and inspections such as integrated system testing (e.g., loss of power/ generator/ats/ups/annunciator integrated system test)

D. The Contractor shall engage in and pay for the services of a NETA Accredited Testing Company to provide testing and inspection applicable electrical equipment and systems as listed above and specified in this section. Also, the NETA testing Contractor will conduct integrated system testing or other testing as required. NETA testing will be conducted per the current Standard for NETA Acceptance Testing Specification including test report preparation and submittals. Technicians performing these electrical tests and inspections shall be trained and experienced concerning the apparatus and systems being evaluated. These individuals shall be capable of conducting the tests in a safe manner and with complete knowledge of the hazards involved. They must evaluate the test data and make a judgment on the serviceability of the specific equipment. Technicians shall be certified in accordance with the current ANSI/NETA ETT, Standard for Certification of Electrical Testing Personnel. Each on-site crew leader shall hold a current certification, Level III or higher, in electrical testing. The testing organization shall provide the following: A written record of all tests and a final report; All field technical services, tooling, equipment, instrumentation, and technical supervision to perform such tests and inspections; Specific power requirements for test equipment; Notification to the Owner's representative prior to commencement of any testing; A written record of all tests and a final report and a timely notification of any system, material, or workmanship that is found deficient based on the results of the acceptance tests. The NETA Contractor will assist in the preparation and performance of other test procedures and inspections such as an acceptance testing of the integrated system (e.g., loss of power/generator/ATS/UPS/annunciator integrated system test)

E. Submit all test reports to the Owners Representative at least two weeks prior to the project final inspection for review.

1.03 SAFETY AND PRECAUTIONS

A. All parties involved must be cognizant of industry-standard safety procedures. This document does not contain any procedures including specific safety procedures. It is recognized that an overwhelming majority of the tests and inspections recommended in these specifications are potentially hazardous. Individuals performing these tests shall be qualified and capable of conducting the tests in a safe manner and with complete knowledge of the hazards involved.

B. Safety practices shall include, but are not limited to, the following requirements:
   1. All applicable provisions of the Occupational Safety and Health Act, particularly OSHA 29 CFR Part 1910 and 29 CFR Part 1926 including OSHA lockout procedures.
   2. ANSI/NFPA 70E, Standard for Electrical Safety in the Workplace.
   3. Applicable state and local safety operating procedures.
   4. Owner's safety practices.
   5. A safety lead person shall be identified prior to the commencement of work.
   6. A safety briefing shall be conducted prior to the commencement of work.
   7. All tests shall be performed with the apparatus de-energized and grounded except where otherwise specifically required to be ungrounded or energized for certain tests.
   8. The testing organization shall have a designated safety representative on the project to supervise operations with respect to safety.

1.04 QUALITY ASSURANCE

A. The testing and inspection shall comply with all applicable sections of the following codes and standards:
   1. American National Standards Institute - ANSI
   2. American Society for Testing and Materials - ASTM
   3. Association of Edison Illuminating Companies - AEIC
   4. Institute of Electrical and Electronics Engineers - IEEE
   5. Insulated Power Cable Engineers Association - IPCEA
   6. International Electrical Testing Association - NETA Acceptance Testing Specifications
   7. California Electrical Code - CEC
   8. National Electrical Manufacturers Association - NEMA
   9. National Fire Protection Association - NFPA
   10. State and Local Codes and Ordinances

B. The inspection and testing shall comply with the project plans and specifications as well as with the manufacturer's drawings, instruction manuals, and other applicable data for the apparatus tested.

C. Review and Approval- All test reports, deficiencies and corrections, test results, shall be reviewed by the Engineer of Record.

1.05 DIVISION OF RESPONSIBILITY

A. Perform routine insulation-resistance, continuity, and rotation tests for all distribution and utilization equipment prior to and in addition to tests performed by the testing firm specified herein.

B. Supply a suitable and stable source of electrical power to each test site. The testing firm shall specify the specific power requirements.

C. Notify the testing firm when equipment becomes available for acceptance tests. Work shall be coordinated to expedite project scheduling.

D. Supply a complete set of electrical plans, specifications, and any pertinent change orders to the testing firm prior to commencement of testing.

E. Notify the Architect and Owner's representative prior to commencement of any testing.

F. Any system, material or installation which is found defective on the basis of acceptance tests shall be reported to the Owner's representative.

G. The testing firm shall maintain a written record of all tests and, upon completion of project, shall assemble and certify a final test report for review and approval by the Engineer of Record.

1.06 ACCEPTANCE TEST PROCEDURES

A. The Acceptance Test Procedure shall include the following sections:
   1. Purpose of Test
   2. References
   3. Test Participants- Name/Company/Telephone Number and hand signed Initials
   4. Equipment and Systems tested.
   5. Description of test.
   6. Acceptance Criteria
   7. Initial Conditions/Prerequisites
   8. Test Equipment and Calibration date
   9. Test Procedure and Date of Test
   10. Test Results-verification of passing acceptance criteria.
   11. Deficiencies, Corrections and Re-test
   12. Verification Systems and Equipment are returned to Operational Status
   13. Conclusions and recommendations.
   14. Appendix, including test forms.

B. Each piece of equipment shall be recorded in the test procedure listing the condition of the equipment as found and as left. Included shall be recommendations for any necessary repair or replacement parts. The test procedures shall indicate the name of the engineer who tested the equipment and the date of the test completion.

C. Inspection Reports may be in situ test reports prepared by manufacturer representatives such as startup test reports by, for example the UPS or Generator manufacturers' startup representative. The inspection reports shall indicate the name of the person who inspected the equipment and the date of completion.

D. The Acceptance Test Procedure shall be a step by step procedure to be followed verbatin and initialed after each step's performance. The test shall include the listed sections above. The procedure shall be prepared on 8.5" x 11" paper. See Attachment 1 as an example.

1.07 TESTING INSTRUMENT TRACEABILITY

A. All applicable test instrumentation shall be currently calibrated within rated accuracy.

B. The accuracy shall be traceable to the National Bureau of Standards in an unbroken chain.

C. Instruments shall be calibrated in accordance with the following frequency schedule:
   1. Field instruments: 6 months maximum.
   2. Laboratory instruments: 12 months.
   3. Leased specialty equipment: 12 months

D. Dated calibration labels shall be visible on all test equipment.

1.08 FINAL SETTINGS

A. The Contractor shall be responsible for implementing all final settings and adjustments of equipment in accordance with manufacturer's and/or Engineer's specified values. The Contractor shall be responsible to request any required setting values from the Engineer.

1.09 SUBMITTALS

A. At least two weeks prior to conducting testing, submit Acceptance Test Procedures and Inspection Reports for review and approval by the Electrical Engineer of Record. This includes the prepared test report outlined above including all systems and equipment to be tested (with the test results, deficiencies, and conclusions sections blank). The Contractor shall be responsible to integrate the testing by the Contractor, Manufacturing Representatives, and NETA testing organization. The NETA testing organization shall prepare the Testing Documents per the current NETA Acceptance Testing Specification and assist the Contractor in preparing an Integrated System Test. The Manufacturing Representative testing organization shall prepare their regular start up test plan and assist the Contractor in preparing an Integrated System Test. After review and approval the test report shall be executed.

B. At least two week prior to conduction testing, submit for review and approval by the Owner the list of test participants and prove of their qualifications and demonstrate they have the necessary testing experience and training to conduct the test.

C. Record copies of the completed test report shall be submitted no more than 30 days after completion of the testing and inspection.

1.10 FAILURE TO MEET TEST

A. Any found defective on the basis of acceptance test shall be reported directly to the Architect.

B. Contractor shall replace the defective material or equipment and have test repeated until test proves satisfactory without additional cost to the Owner.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 EQUIPMENT TO BE TESTED AN INSPECTED

A. The following equipment shall be tested in accordance with the scopes of work which follow and additional participation in other acceptance testing such as integrated system and functional testing. Acceptance test procedures and inspection reports shall be prepared, submitted and approved prior to performance of testing and inspections. The party responsible is identified in accordance with the following key: C = Contractor/Installer; M = Manufacturer; T = Testing Agency.
   1. Molded Case Circuit Breakers - C
   4. Fire Alarm System - M
   5. Grounding System - C
   6. Cables, Low Voltage, 600 Volts Maximum - C
   7. Ground Fault Systems - C
   10. Low Voltage Switchboards - T
   11. Low Voltage Power Circuit Breakers and Insulated Case Circuit Breakers - T
   12. Lighting Control System - C
   17. Telecommunications Systems-C or M
   18. Other Systems-C, M, T

3.02 INSPECTIONS

A. DRY TYPE TRANSFORMERS
   1. Visual and Mechanical Inspection:
      a. With case covers removed, inspect transformer core and coil assembly and enclosure interior. Cloth wipe and brush major insulating surfaces.
      b. Check primary, secondary, and ground connections.
      c. Check tap connections and tap changer.
      d. Inspect all bolted connections. Torque wrench tighten or remake any questionable connections.
      e. Inspect insulators, spacers, and windings.
      f. Inspect for adequate electrical clearance.
      g. Check base or support insulators, including vibration isolation supports.
      h. Check accessory devices for condition and proper operation.
      i. Verify that the transformers have been provided with adequate spacing for ventilation.

B. MOLDED CASE CIRCUIT BREAKERS
   1. Visual and Mechanical Inspection:
      a. Inspect cover and case, and check for broken or loose terminals.
      b. Operate breaker to check operation.
      c. Verify proper reporting of the events on the project equipment monitoring system
   2. Electrical Tests (400 ampere frame and larger):
      a. Insulation Resistance Test: Megger main poles of breaker pole-to-pole, from each pole to ground, and across the open contacts of each pole.
      b. Contact Resistance Test: Ductor across main pole contacts with breaker closed and latched to check for good, low resistance contact.
      c. Test overcurrent trip device and calibrate. Where primary injection testing is specified, test each pole of the breaker individually. Data shall be compared with manufacturer's published data.
         1) All trip units shall be tested by primary injection.
         2) Static overcurrent trip devices shall be tested per manufacturer's instructions.
         3) Test for minimum pick-up current.
         4) Apply 300% of pick-up current and measure time necessary to trip breaker (long time delay).

5) Where short time delay characteristics are provided, test short time pick-up and delay.
6) Test instantaneous trip by passing current sufficiently high to trip breaker instantaneously.
7) Where ground fault protection is provided, test ground fault pick-up and delay.
8) Check reset characteristics of trip unit.
9) Electrically test any auxiliary devices such as shunt trips, undervoltage trips, alarm switches, and auxiliary switches.

C. FIRE ALARM SYSTEM
1. Visual and Mechanical Inspection:
a. Inspect each device for physical damage.
b. Check for proper labeling of conductors.
c. Inspect all test switches for proper operation.
d. Inspect all system lamps and LED's for proper operation. Replace all non-operational equipment.
e. Check all cabinet doors latches and hinges for proper operation. Adjust, lubricate, and repair as required.
f. Verify proper reporting of the events on the project equipment monitoring system.
2. Electrical Tests: Test each individual circuit at panel with equipment connected for proper operation. Entire system shall test free from opens, grounds, and short circuits. Verify control circuit integrity: Field tests to verify component compliance with specifications, adjusting, calibrating, and setting circuit breaker, relays, timers, etc. Testing will include, but not be limited to the following:
a. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.
b. Close each sprinkler system control valve and verify proper supervisory alarm at the FACP.
c. Verify activation of all flow switches.
d. Open initiating device circuits and verify that the trouble signal actuates.
e. Open and short signaling line circuits and verify that the trouble signal actuates.
f. Open and short indicating appliance circuits and verify that trouble signal actuates.
g. Ground all circuits and verify response of trouble signals.
h. Check presence and audibility of all alarm notification devices.
i. Check installation, supervision, and operation of all intelligent smoke detectors.
j. Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.
k. When the system is equipped with optional features, the manufacturer's manual should be consulted to determine the proper testing procedures. This is intended to address such items as verifying controls performed by individually addressed or grouped devices, sensitivity monitoring, verification functionality and similar.
l. Check the integrity of the software program with the system in complete operation. Verify that each message reported is correct with respect to the signal received. All possible operating conditions and system troubles shall be tested. Rewrite software as required.
m. Apply firmware, updated and/or upgrade software if necessary.

D. GROUNDING SYSTEM
1. Visual and Mechanical Inspection:
a. Inspect wiring system outlet and junction boxes for proper grounding. Green grounding conductor shall be connected to outlet and junction boxes. Inspect a minimum of 5% of project boxes.

b. Verify connections of grounds for the secondary of separately derived grounding systems, i.e. at dry type transformers. Note type of connection, i.e. mechanical or exothermic.
c. Verify proper connection to all components of building service entrance grounding system. Note all system components which are interconnected and type of connection either mechanical or exothermic. Note depth of driven ground rods.

2. Electrical Tests (Small Systems):
   a. Perform ground-impedance measurements utilizing the fall-of-potential method per ANSI/IEEE Standard 81 "IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System". Instrumentation utilized shall be specifically designed for ground impedance testing. Provide sufficient spacing so that plotted curves flatten in the 62% area of the distance between the item under test and the current electrode.
   b. Equipment Grounds:
      1) Utilize two-point method of IEEE Std. 81. Measure between equipment ground being tested and known low-impedance grounding electrode or system.
3. Electrical Tests (Large Systems):
   a. When sufficient spacing of electrodes described above is impractical, perform ground-impedance measurements utilizing either the intersecting curves method or the slope method. (Ref. Nos. 40 and 41 in IEEE Std. 81.)
   b. Test Values:
      1) The main ground electrode system impedance-to-ground should be no greater than five (5) ohms. Equipment grounds, depending on size and length of grounding conductor, should be only fractionally higher than system ground.

E. CABLES - LOW-VOLTAGE - 600V MAXIMUM
1. Visual and Mechanical Inspection:
   a. Inspect cables for physical damage and proper connection in accordance with single-line diagram.
   b. Test cable mechanical connections to manufacturer's recommended values using a calibrated torque wrench.
   c. Check cable color-coding with applicable specifications and National Electrical Code standards.
2. Electrical Tests:
   a. Perform insulation-resistance test on each feeder on the riser diagram with respect to ground and adjacent conductors. Applied potential shall be 1000 volts dc for 1 minute.
   b. Perform continuity test to insure proper cable connection.
   c. Test Values:
      1) Evaluate results by comparison with cables of same length and type. Investigate any values less than 50 megohms.
      2) Provide a test report for each feeder which indicates the manufacturer's target values and actual test reading. Report shall indicated pass/fail for each feeder. Submit report to Owner's representative for approval. Include test report in project maintenance manual.
   d. Feeder Cables:
      1) 600-volt feeder cables in the building and secondary service cables to the building shall be tested using a megohmeter, to measure the insulation resistance of each conductor in the circuit.
      2) Disconnect all equipment switches, relays, buswork, transformers, etc.) from the cable being tested.
      3) Tests to be performed in a dry area.
      4) Clean and dry cable ends with a cloth moistened with a suitable solvent.

e. Cable Values: Cable values shall be established and provided by the cable manufacturer. Provide target value insulation resistance (IR) in megohms, based on 1000 ft. at 60 Deg F.
f. Temperature Correction Factor: For temperatures above or below 60ºF, a correction factor may have to be applied to determine the true IR value. However, if the measured IR of the system is equal to or greater than the calculated value, a correction factor is not needed.
g. Correct insulation deficiencies which show and insulation resistance of less than one megohm.
h. Test conductors with power off and impress a voltage of not less than 500 volts D.C.
i. Perform continuity tests on all conductors.

F. GROUND-FAULT SYSTEMS (CEC 230-95)
1. Visual and Mechanical Inspection:
a. Inspect for physical damage and compliance with drawings and specifications.
b. Inspect neutral main bonding connection to assure:
1) Zero-sequence sensing system is grounded.
2) Ground-strap sensing systems are grounded through sensing device.
3) Ground connection is made ahead of neutral disconnect link on zero-sequence sensing systems.
4) Grounded conductor (neutral) is solidly grounded.
c. Inspect control power transformer to ensure adequate capacity for system.
d. Manually operate monitor panels (if present) for:
1) Trip test.
2) No trip test.
3) Nonautomatic reset.
e. Record proper operation and test sequence.
f. Set pickup and time-delay settings in accordance with the settings provided by the University's Representative.
g. Verify proper reporting of the events on the project equipment monitoring system.
2. Electrical Tests:
a. Measure system neutral insulation to ensure no shunt ground paths exist. Remove neutral-ground disconnect link. Measure neutral insulation resistance and replace link.
b. Determine the relay pickup current by current injection at the sensor and operate the circuit interrupting device.
c. Test the relay timing by injecting three hundred percent (300%) of pickup current, or as specified by manufacturer.
d. Test the system operation at fifty-seven percent (57%) rated control voltage, if applicable.
e. Test zone interlock systems by simultaneous sensor current injection and monitoring zone blocking function.
f. On multiple source, tie breaker, etc., systems, devise a simulation scheme that fully proves correct operation.
g. Test Parameters:
1) System neutral insulation shall be a minimum of one hundred (100) ohms, preferably one (1) megohm or greater.
2) Relay timing shall be in accordance with manufacturer's published time-current characteristic curves but in no case longer than one (1) second for fault currents equal to or greater than 3,000 amperes.
3) Relay pickup value shall be within +10% of setting and in no case greater than 1200A.

G. LOW VOLTAGE SWITCHBOARDS
   1. Visual and Mechanical Inspection:
      a. Verify that the enclosure interiors have been cleaned of accumulated dust, dirt, oil films, and other foreign materials.
      b. Inspect all electrical and mechanical components for condition and any evidence of defects or failure.
      c. Check for proper travel and alignment of any drawout or plug-in circuit breakers.
      d. Check breaker connections to bus.
      e. Inspect bolted connections. Torque wrench tighten or remake any questionable connections.
      f. Inspect for missing or loose hardware or accessories.
      g. Inspect ground bus connections.
      h. Operate key and door interlock devices to assure proper operation.
      i. Verify proper reporting of the events on the project equipment monitoring system.
   2. Electrical Tests:
      a. Insulation Resistance Test: Megger main secondary bus and feeder circuits phase-to-phase and phase-to-ground.
      b. Energize any space heater circuits to insure proper operations.
      c. Check phase rotation with a Biddle phase rotation meter.
      d. Instruments and Meter Tests:
         1) Inspect panel mounted instruments and meters. Clean and check for calibration accuracy. Make minor adjustments as necessary.

H. LOW VOLTAGE POWER CIRCUIT BREAKERS AND INSULATED CASE CIRCUIT BREAKERS
   1. Visual and Mechanical Inspection:
      a. Remove each draw-out type circuit breaker.
      b. Inspect arc chutes of power circuit breakers.
      c. Inspect circuit breaker for defects or damage.
      d. Inspect and check contacts. Check alignment, over-travel, and pressure. Adjust if necessary.
      e. Inspect finger clusters on line and load stabs of draw-out circuit breakers.
      f. Check for proper mechanical operation. Lubricate where necessary.
      g. Check auxiliary devices for proper operation.
      h. Check breaker racking device (if applicable) for alignment and friction-free operation. Lubricate if necessary.
      i. Verify proper reporting of the events on the project equipment monitoring system.
   2. Electrical Tests:
      a. Insulation Resistance Test: Megger main poles of breaker pole-to-pole, from each pole to ground, and across the open contacts of each pole.
      b. Contact Resistance Test: Ductor across main pole contacts with breaker closed and latched to check for good, low resistance contact.
      c. Test overcurrent trip device by primary injection and calibrate to settings provided. Static overcurrent trip devices shall be tested per the manufacturer's instructions. Test each pole of the breaker individually. Data shall be compared with manufacturer's published data.
         1) Test for minimum pick-up current.
         2) Apply 300% of pick-up current and measure time necessary to trip breaker (long time delay).
         3) Where short time delay characteristics are provided, test short time pick-up and delay.
         4) Test instantaneous trip by passing current sufficiently high to trip breaker instantaneously.
         5) Where ground fault protection is provided, test ground fault pick-up and delay.
         6) Check reset characteristic of trip unit.

d. Electrically test any auxiliary devices such as shunt trips, undervoltage trips, alarm contacts, and auxiliary contacts.

I. LIGHTING CONTROL SYSTEM
1. Visual and Mechanical Inspection:
a. Inspect each device for physical damage.
b. Check for proper labeling of conductors.
c. Inspect all system lamps and LED's for proper operation. Replace all non-operational equipment.
d. Check all cabinet doors, latches, and hinges for proper operation. Adjust, lubricate, and repair as required.
2. Electrical Tests:
a. Verify the absence of unwanted voltages between circuit conductors and ground that would constitute a hazard or prevent proper system operation.
b. Meggar test all conductors (other than those intentionally grounded) for isolation from ground.
c. Test all conductors (other than those intentionally connected together) for conductor-to-conductor isolation using as insulation testing device.
d. The control unit shall be tested to verify it is in the proper operating condition as detailed in the manufacturer's manual.
e. Each control circuit shall be tested to confirm proper operation of the circuit. Monitor the system with all building equipment energized, such as variable speed controllers, to verify the absence of control inhibiting electrical noise.

END OF SECTION

SECTION 26 09 43
LIGHTING CONTROL SYSTEM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Digital-network lighting control system and associated components:
   1. Power panels.
   2. LED drivers.
   3. Power interfaces.
   4. Lighting control modules
   5. Lighting management hubs
   6. Lighting management system
   7. Lighting management system software.
   8. Control wall stations.
   9. Low-voltage control interfaces
   10. Wired sensors
   11. Wireless sensors
   12. Software and site-specific system programming
   13. Services as specified
   14. Accessories

1.02 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the placement of sensors and wall controls with millwork, furniture, equipment, etc. installed under other sections.
   2. Coordinate the placement of wall controls with actual installed door swings.
   3. Coordinate the placement of daylight sensors with windows, skylights, and luminaires to achieve optimum operation. Coordinate placement with ductwork, piping, equipment, or other potential obstructions to light level measurement installed under other sections.
   4. Notify Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

1.03 SUBMITTALS

A. See Section 26 01 00 General Requirements of Electrical Work for submittal procedures.

B. Product Data: Include ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.

C. Manufacturer's Installation Instructions: Include application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

D. Title 24 Acceptance Testing Documentation: Submit Certification of Acceptance and associated documentation for lighting control acceptance testing performed in accordance with CAL TITLE 24 P6, as specified in Part 3 under “COMMISSIONING”.

E. Project Record Documents: Record actual installed locations and settings for lighting control system components.

F. Operation and Maintenance Data: Include detailed information on lighting control system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.

G. Warranty: Submit sample of manufacturer's Warranty or Enhanced Warranty as specified in Part 1 under "WARRANTY". Submit documentation of final execution completed in Owner's name and registered with manufacturer.

H. Software: One copy of software provided under this section. Coordinate the following with Owner's IT Representative:
   1. Where the system and/or software will reside.
   2. Any required interfacing with the Owner's Network system.
   3. Remote monitoring required by software.
   4. Software maintenance and subscription.

I. Record Drawings/Software (As-Builts) - Provide As-Built drawings showing installed location of all devices and equipment on plans. Provide backup copy of actual final software and lighting system programming in memory device such as USB flash stick. Verify media with Owner. If lighting computers fail, backup copy(s) shall allow the restoration in a replacement computer.

1.04 QUALITY ASSURANCE

A. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

B. Title 24 Acceptance Testing Technician Qualifications: Certified by a California approved Acceptance Test Technician Certification Provider as an Acceptance Test Technician (ATT) in accordance with CAL TITLE 24 P6.

C. Operational Test:
   1. Perform an operational test to assure that the installation complies with all requirements of the Specifications. Test shall be made in the presence of the Engineer.
   2. If any part of the system fails the test, it must be corrected and the test repeated until it satisfactorily passes the test.

D. Training:
   1. Provide manufacturer's system training necessary for the Owner's personnel. The scope of training should include training sequences available at the job site.
   2. The number of persons attending the system training courses shall be determined by the Owner's representative. The training at the job site shall be provided prior to system approval by the Owner's representative.
   3. System operating training shall be given by an experienced and competent manufacturer's representative competent with the lighting control system.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store products in a clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation.

1.06 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.07 WARRANTY

A. Manufacturer's Standard Warranty, With Manufacturer Start-Up.
   1. Manufacturer Lighting Control System Components, Except Lighting Management System Computer, Ballasts/Drivers and Ballast Modules:
      a. First Two Years:
         1.) 100 percent replacement parts coverage, 100 percent manufacturer labor coverage to troubleshoot and diagnose a lighting issue.
         2.) First-available on-site or remote response time.
         3.) Remote diagnostics for applicable systems.
      b. Telephone Technical Support: Available 24 hours per day, 7 days per week, excluding manufacturer holidays.
   2. Ballasts/Drivers and Ballast Modules: Five years 100 percent parts coverage, no manufacturer labor coverage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable: Acuity Brands Lighting Controls, Lutron, Leviton or equal.

2.02 GENERAL

A. Provide system hardware that is designed, tested, manufactured, warranted by a single manufacturer

B. Operational Life: At least 10 years expected life while operating within the specified ambient temperature and humidity range

C. Standards Compliance & Compatibility: Provide architectural control product with BACnet/IP

D. Luminaire Compatibility: Support native control of Tunable White luminaires.

E. Design and test equipment to withstand electrostatic discharges without impairment when tested according to IEC 61000-4-2 Level 4

F. Power Failure Memory: automatically store system settings and recover from a power failure without requiring user input

G. Wireless devices:
   1. Automatically sync for system operation without addressing
   2. Send and receive messages for real-time operation and feedback
   3. Use industry standard RF protocols
   4. Be in compliance with FCC and IEEE standards

H. Time Clock: automatically adjust for daylight savings time and leap year.

2.03 DIMMING AND SWITCHING PERFORMANCE REQUIREMENTS

A. Electrolytic capacitors operate at least 36 degrees F (20 degrees C) below the capacitor's maximum temperature rating when the device is under full load

B. Inrush tolerance: Use MOSFET that has a maximum rating of six times the operating current of the dimmer/relay

C. Surge tolerance: Panels are designed and tested to withstand surges of 6,000V, 3,000A according to IEEE C62.41.2 and IEC 61000-4-5 without impairment to performance

D. Power failure recovery: When power is interrupted and subsequently restored, within 3 seconds lighting to automatically return to same levels prior to power failure

E. Utilize half cycle to half cycle zero cross movement to allow for voltage compensation in order to overcome line noise and lamp flickering

F. Incorporate electronic soft start default at initial turn-on that smoothly ramps lights to appropriate levels within 0.5 seconds

G. Utilize air gap off to disconnect the load line from the line supply

H. Control all light sources in smooth and continuous manner. Dimmers with visible steps are not acceptable

I. Assign load type to each dimmer that will provide proper dimming curve for the specific light source to be controlled

J. Minimum and maximum light levels are user adjustable on a circuit by circuit basis

2.04 LIGHTING CONTROL PANELS

A. General Requirements
   1. Comply with UL508
   2. Universal voltage operation 120V-277V (MVOLT)
   3. Available as Factory-assembled
   4. Available as 4-wire Main Lug
   5. Configurable for site conditions with certain modules and circuit breakers

6. Field wiring channel to separate line voltage and low voltage
7. Available voltage barrier
8. Locking breaker cover
9. Convection cooled, no fans required
10. Available with UL924 listed phase loss sensor device

B. Factory installed bypass circuit jumpers on each dimming circuit

C. Provide main lugs and branch circuit protection for each power module

D. Branch circuit rating
1. 120V: 2,000W (20A)
2. 277V: 2,700W (10A)

E. Branch circuit breakers (when supplied) UL listed thermal magnetic
1. 120V: 14kAIC
2. 277V: 14kAIC

F. Integral USB port for PC based panel programming

G. Mounting: Recessed or surface mounted NEMA type 1 enclosure

H. Compatible lighting loads: incandescent, magnetic low voltage, electronic low voltage, 2 and 3 wire fluorescents, forward and reverse phase LED dimming

2.05 LOW VOLTAGE WALL STATIONS

A. Push button or slider controller
1. Use Cat5 wiring with RJ45 adapters for connection between devices
2. Recess into single gang junction box
3. Allows control of any lighting fixtures part of the lighting control system
4. Controller can be setup as scene recall, toggle, or raise/lower
5. Allows connection to additional stations, sensors, or power packs
6. Custom button engraving

2.06 REMOTE MOUNTED POWER MODULES

A. Networked relay and dimming power packs
1. Power pack will incorporate one or more Class 1 relays and contribute low voltage power to the rest of the system
2. Secondary power packs incorporate the relay(s), 0-10VDC dimming output, or line voltage dimming output
3. Accept 120/277VAC and plenum rated
4. All devices have two RJ-45 ports.
5. Parameters available and configurable remotely from software and locally via device push-button
6. Power pack to be securely mounted to junction box with ½ inch threaded chase nipple or mounted within luminaire ballast channel
7. Power (secondary) packs that provide up to 16A switching of all load types
8. Power (secondary) packs that provide up to 5A switching of all load types as well as 0-10VDC dimming or fluorescent ballasts/LED drivers
9. Specific secondary packs provide up to 5A of switching and can dim 120VAC incandescent or 120/277VAC line voltage dimmable fluorescent (2-wire and 3-wire versions)
10. Specific secondary packs provide up to 5A of switching and can dim 120/277VAC magnetic low voltage transformers
11. Specific secondary packs provide up to 5A of switching and can dim 120VAC electronic low voltage
12. Specific power/secondary are UL924 listed for switching of emergency power circuits

B. Power pack with 16A relay

C. Power pack with 5A relay and 0-10VDC output
D. Secondary power pack with 16A relay
E. Secondary power pack with 2 5A relays
F. Secondary power pack with 5A relay and 0-10VDC dimming output
G. UL924 listed secondary power pack with 16A relay for switching emergency lighting circuit
H. Secondary power pack with 5A relay and 2 or 3-wire fluorescent dimming output
I. Secondary power pack with 5A relay and magnetic low voltage dimming output
J. Secondary power pack with 5A relay and electronic low voltage dimming output

2.07 DIGITAL SENSORS

A. Wired Networked Occupancy/Vacancy Sensors/Photocells
B. Network Wall Switch Sensors
   1. PIR, 1 or 2 Relays
   2. Dual Technology, 1 or 2 Relays
   3. PIR, No Relay, Raise/Lower Dim Control
   4. Dual Technology, No Relay, Raise/Lower Dim Control
C. Network Fixture Embedded Sensors
   1. PIR, No Relay
   2. PIR w/Photocell, No Relay
   3. Technology, No Relay
   4. Dual Technology w/Photocell, No Relay
   5. Dimming photocell
D. Network Standard Range 360° Ceiling and Fixture Mount Sensors
   1. Low Voltage, Dual Technology
   2. Line Voltage, Dual Technology
   3. Line Voltage, PIR, 2-Pole
   4. Line Voltage, Dual Technology, 2-Pole
   5. Low Voltage, PIR
   6. Line Voltage, PIR
E. General requirements
   1. Occupancy sensors sense presence of human activity within the desired space and control on/off function of the lights
   2. Utilize passive infrared (PIR) technology which detects occupant motion
   3. Sensors are available for ceiling, wall, corner, recessed, and fixture mounting conditions
   4. Dual technology sensors utilize PIR/Microphonics (also known as Passive Dual Technology or PDT)
   5. Sensors utilizing Microwave or Ultrasonic technology will not be accepted
   6. Sensors are available with zero, one, or two Class 1 switching relays, and up to one 0-10VDC dimming output.
   7. Provide multiple lens options which are interchangeable for specific applications
   8. Communication and Class 2 low voltage power is delivered to each device with CAT-5 cabling and terminate with RJ-45 connectors
   9. All sensors have two RJ-45 ports for purpose of daisy chain wiring method
   10. Sensors are equipped with automatic override for 100 burn-in of lamps
   11. Sensors capable of being embedded into luminaire
   12. Photocells provide on/off set-point and deadband to prevent artificial light from cycling
   13. Photocell and dimming sensor set-point is automatically calibrated using sensor microprocessor
   14. Photocell min/max thresholds may be manually configured
   15. Dimming sensors control 0-10VDC dimmable ballasts by sinking up to 20mA of Class 2 current

2.08 DEVICE QUALITY

A. Perform 100% function testing of all devices

PART 3 EXECUTION

3.01 INSTALLATION

A. Follow manufacturer's instructions for all installation steps
B. Provide a complete installation per Contract Documents
C. Properly terminate all wiring per installation instructions
D. Use only recommended cable and follow local codes
E. Properly terminate all CAT5 wiring per installation instructions
F. Properly terminate all connections per installation instructions

3.02 STARTUP AND PROGRAMMING

A. Provide telephone support via toll free line
B. Factory trained service available for purchase

3.03 MAINTENANCE

A. Factory trained service technicians available within the continental US
B. Offer integrated help on-screen and via online videos
C. Factory telephone support via toll free line

END OF SECTION

SECTION 26 22 00
LOW-VOLTAGE TRANSFORMERS

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

A. The General Conditions, Supplementary General Conditions, Special Conditions and Division 1 General Requirements apply to the work of this section.

B. This section describes requirements for dry type transformer.

C. This section describes requirements for dry type transformer K-rated.

1.02 RELATED WORK

A. Section 26 01 00: General Requirements for Electrical Work.

1.03 REFERENCE STANDARDS

A. The Underwriters Laboratory, Inc. (UL).

B. National Electrical Manufacturers Association (NEMA).

1.04 QUALIFICATIONS

A. The equipment manufacturer shall be ISO 9000, 9001 or 9002 certified.

B. The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of five (5) years. When requested by the Architect, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.

C. The transformers shall be suitable for and certified to meet all applicable seismic requirements of the International Building Code (IBC) for zone 4 application. Guidelines for the installation consistent with these requirements shall be provided by the transformer manufacturer and be based upon testing of representative equipment.

D. The test response spectrum shall be based upon a 5 percent minimum damping factor, IBC: a peak of 0.75g, and a ZPA (zero period acceleration) of 0.38g. The tests shall fully envelope this response spectrum for all equipment natural frequencies up to at least 35Hz.

1.05 SUBMITTALS

A. Manufacturers Data:
   1. Dimension drawing and weight.
   2. Technical certification sheet.
   3. Conduit entry/exit locations.
   4. Transformer ratings including:
      a. Primary and secondary kVA.
      b. Voltage.
      c. Taps.
      d. Primary and secondary continuous current.
      e. Basic Impulse level for equipment over 600-volts.
      f. Impedance.
      g. Insulation class and temperature rise.
      h. Sound level.

PART 2 PRODUCTS

2.01 TRANSFORMERS - GENERAL REQUIREMENTS

A. Description: Factory-assembled, dry type transformers for 60 Hz operation designed and manufactured in accordance with NEMA ST 20 and listed, classified, and labeled as suitable for the purpose intended.

B. Unless noted otherwise, transformer ratings indicated are for continuous loading according to IEEE C57.96 under the following service conditions:

1. Altitude: Less than 3,300 feet (1,000 m).
2. Ambient Temperature:
   a. Greater than 10 kVA: Not exceeding 104 degrees F (40 degrees C).
   b. Less than 10 kVA: Not exceeding 77 degrees F (25 degrees C).
3. Ambient Temperature: Not exceeding 86 degrees F (30 degrees C) average or 104 degrees F (40 degrees C) maximum measured during any 24 hour period.

C. Core: High grade, non-aging silicon steel with high magnetic permeability and low hysteresis and eddy current losses. Keep magnetic flux densities substantially below saturation point, even at 10 percent primary overvoltage. Tightly clamp core laminations to prevent plate movement and maintain consistent pressure throughout core length.

D. Impregnate core and coil assembly with non-hydroscopic thermo-setting varnish to effectively seal out moisture and other contaminants.

E. Basic Impulse Level: 10 kV.

F. Ground core and coil assembly to enclosure by means of a visible flexible copper grounding strap.

G. Isolate core and coil from enclosure using vibration-absorbing mounts.

H. Nameplate: Include transformer connection data, ratings, wiring diagrams, and overload capacity based on rated winding temperature rise.

2.02 DRY TYPE POWER TRANSFORMERS

A. General: Provide dry type power transformers, for lighting and general power applications, rated as indicated.

B. Transformers shall be designed for continuous operation at rated kVA, for 24 hours a day, yearly operation, with normal life expectancy as defined in American National Standards Institute (ANSI) C57.96.

C. Shipping: Provide lifting holes, accessible without removal of any of the enclosure components.

D. Insulation, as listed:

Insulation Size	Temperature Class	Rating	Hot Spot Allowance
2kVA & below	NEMA B or better	80 degrees C rise	30 degrees C
3kVA thru 15 kVA	NEMA F or better	115 degrees C rise	30 degrees C
15kVA and above	NEMA H	150 degrees C rise	30 degrees C

E. Base temperature rating and hot spot allowances in the above table on a 40 degrees C maximum ambient temperature and 30 degrees C average ambient temperature.

F. Overload Capacity: 10 percent above full load rating continuously in an ambient not exceeding 40 degrees C.

G. Case Temperature: Maintain no more than a 35 degrees C rise above a 40 degrees C ambient.

H. Taps, as listed:

Transformer Rating	Phase	Taps
Through 10kVA	Single	None
15kVA thru 25kVA	Single	(2) 5 percent FCBN (Full Capacity Below Normal)
6kVA thru 15kVA	Three	(2) 5 percent FCBN
30kVA and larger	Single and Three	(2) 2-1/2 percent FCAN and (4) 2-1/2 percent FCBN where FCBN

I. Sound levels, not to exceed listed values, as determined by NEMA standards:

Size	Sound Level in dB
Through 9kVA	40
10 through 50kVA	45
51 through 150kVA	50
151 through 300kVA	55
301 through 500kVA	60
501 through 700kVA	62
701 through 1000kVA	64

J. Provide vibration isolating mounts to isolate the enclosure from the core and coil assembly.

K. Mounting, suitable as listed:
   1. Single Phase Transformers: Wall
   2. Three Phase Transformers, through15kVA: Wall.
   3. Three Phase Transformers, 15kVA and above: Floor or ceiling hung channel.

L. Provide conduit knockouts for line and load conduit entrance.

M. Enclosure:
   1. Units rated 30kVA and below, the encapsulated enclosure construction shall be totally enclosed, non-ventilated, NEMA 3R, with lifting eyes.
   2. Units rated 15kVA and above, the enclosure construction shall be ventilated, NEMA 2, drip-proof, with lifting holes. All ventilation openings shall be protected against falling dirt.
   3. Outdoor units rated 15kVA or above, provide suitable weather-shields over ventilation openings.

N. Finish: Degrease, clean, phosphatize, prime and finish all interior and exterior surfaces with baked enamel, color ANSI 61 or standard factory grey.

O. Connect a grounding strap from the secondary neutral to a grounding lug on the enclosure.

P. Terminals: As specified in Section 26 01 00.

Q. Subject transformers 25kVA above to listed production test at factory:
   1. Ratio tests at the rated voltage connection and at all tap connections.
   2. Polarity and phase relation tests on the rated voltage connection.
   3. Applied potential tests.
   4. Induced potential test.
   5. No-load and excitation current at rated voltage on the rated voltage connection.

R. Factory to perform the listed standard tests on unit of identical design:
   1. No-load losses.
   2. Total losses.
   3. Sound levels.
   4. Temperature rise.
   5. Impulse.
   6. Impedance.
   7. Induced potential.
   8. Applied potential.

S. Submit certified test reports for production and standard tests.

T. Manufacture: Cutler-Hammer, General Electric, Sorgel.

2.03 DRY TYPE POWER TRANSFORMERS (K-FACTOR RATED)

A. General: Provide dry type power transformers, for lighting and general power applications, rated as indicated.

B. Transformers shall be designed for continuous operation at rated kVA, for 24 hours a day, yearly operation, with normal life expectancy as defined in American National Standards Institute (ANSI) C57.96.

C. The transformers shall be specifically designed to supply circuits with a harmonic profile equal to or less than a K-factor of 4 to 13 without exceeding 115 degree C temperature rise.

D. Shipping: Provide lifting holes, accessible without removal of any of the enclosure components.

E. Insulation, as listed:

Insulation Size	Temperature Class	Rating	Hot Spot Allowance
2kVA & below	NEMA B or better	80 degrees C rise	30 degrees C
3kVA thru 15kVA	NEMA F or better	115 degrees C rise	30 degrees C
15kVA & above	NEMA H	150 degrees C rise	30 degrees C

F. Base temperature rating and hot spot allowances in the above table on a 40 degrees C maximum ambient temperature and 30 degrees C average ambient temperature.

G. Case Temperature: Maintain no more than a 35 degrees C rise above a 40 degrees C ambient.

1. Taps, as listed:

Transformer Rating	Phase	Taps
Through 10kVA	Single	None
15kVA thru 25kVA	Single	(2) 5 percent FCBN
6kVA thru 15kVA	Three	(2) 5 percent FCBN
30kVA and larger	Single and Three	(2) 2-1/2 percent FCAN and (4) 2-1/2 percent FCBN

H. Sound levels, not to exceed listed values, as determined by NEMA standards:

Size	Sound Level in dB
Through 9kVA	40
10 through 50kVA	45
51 through 150kVA	50
151 through 300kVA	55
301 through 500kVA	60
501 through 700kVA	62
701 through 1000kVA	64

I. Non-linear ratings, to supply circuits with a harmonic profile equal or less than a K-factor of 13 as listed below without exceeding 115 degree C temperature rise:

Harmonic	K-13
Fund.	100%
3rd	70%
5th	42%
7th	5%
9th	3%
11th	3%
13th	1%
15th	.7%
17th	.6%

J. Provide vibration isolating mounts to isolate the enclosure from the core and coil assembly.

K. Mounting, suitable as listed:
   1. Three Phase Transformers, 15kVA and above: Floor or ceiling hung channel.

L. Provide conduit knockouts for line and load conduit entrance.

M. Finish: Degrease, clean, phosphatize, prime and finish all interior and exterior surfaces with baked enamel, color ANSI 61 or standard factory grey.

N. Connect a grounding strap from the secondary neutral to a grounding lug on the enclosure.

O. Terminals: As specified in - Basic Materials and Methods.

P. Subject transformers 25kVA above to listed production test at factory:

Q. Applied potential: 4kV.
   1. Induced potential: 2 times normal to 7200Hz.
   2. Ratio tests at the rated voltage connection and at all tap connections.
   3. Polarity and phase relation tests on the rated voltage connection.
   4. No-load and excitation current at rated voltage on the rated voltage connection.

R. Perform the listed standard tests on unit of identical design:
   1. No-load losses.
   2. Total losses.
   3. Sound levels.
   4. Temperature rise.

S. Impulse:
   1. Impedance.
   2. Induced potential.
   3. Applied potential.

T. Submit certified test reports for production and standard tests.

U. Manufacture: Cutler-Hammer, General Electric, Sorgel.

PART 3 EXECUTION

3.01 DRY TYPE POWER TRANSFORMER

A. Mount transformer on floor or wall as indicated.

B. Provide one (1) vibration isolating mount, minimum 1 inch thick with 1 inch static deflection, for each mounting point on the transformer.

C. Connect transformer with flexible metal conduit. Provide an insulated grounding bushing on conduit and bond to transformer case.

END OF SECTION

This page intentionally left blank

SECTION 26 24 13
SWITCHBOARDS

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

A. The General Conditions, Supplementary General Conditions, Special Conditions and Division 1 General Requirements apply to the work of this section.

B. This section describes requirements for switchboards equipment.

1.02 RELATED WORK

A. Section 26 01 00: General Requirements for Electrical Work.

1.03 REFERENCE STANDARDS

A. The Underwriters Laboratory, Inc. (UL).

B. National Electrical Manufacturers Association (NEMA).

1.04 SUBMITTALS

A. Manufacturers Data:
   1. Switchboard.

B. Shop Drawings:
   1. Switchboard.

PART 2 PRODUCTS

2.01 OVERCURRENT PROTECTIVE DEVICES

2.02 SWITCHBOARD

A. Construction:
   1. Enclosure: Rigid, dead-front, metal enclosed, free standing, bussed structures, bolted together. Provide removable, 12 gauge sheet steel, minimum, screw-on access plates at front, top and rear. NEMA 3R.
   2. Quality control: Provide each vertical section which is composed of UL listed devices with a UL Label. Provide switchboard which conforms to applicable NEMA standards. Test switchboard at factory before delivery.

B. Bussing:
   1. Phase Bus: Silver-plated copper, rated 1,000 amperes per square inch cross sectional area maximum, braced for 50,000 RMS amperes minimum.
   2. Neutral Bus: Full-size, aluminum, copper, with lugs for connection of neutral conductors.
   3. Ground Bus: Half-size, copper, with lugs for connection of ground conductors.
   4. Spacing: Maintain code separation between phases and between phase and ground.

C. Shipping:
   1. Provide lifting eyes for handling switchboard.
   2. Provide shipping splits, if required and main bus-splice plates for reconnection at job site.

D. Finish: Degrease, clean, phosphatize, prime, and finish all interior, and exterior surfaces with baked enamel, color American National Standards Institute (ANSI) 61, or standard factory grey.

E. Nameplates: Provide nameplates for all circuit breakers and manufacturers' nameplate indicating voltage and current rating, switchboard type and shop order number.

F. Padlocking Devices: All breakers shall be lockable in the open position and the locking mechanism shall remain in place with or without the lock installed.

G. Circuit Breakers: Provide circuit breakers in frame sizes 100 through 800 amperes with thermal-magnetic trip units. Provide circuit breakers in frame sizes 1200 through 2000 amperes with electronic trip units that are insensitive to changes in ambient temperature within the circuit breaker's normal operating temperature range. Provide facility in 400 through 800 ampere frame circuit breakers for either thermal-magnetic or electronic interchangeable trip units. Provide circuit breakers with toggle-type handles which are trip-free and trip-indicating. All poles of multi-pole device shall operate simultaneously during open, close and trip operations. Provide circuit breakers indicated with the following ratings:

Circuit Breaker Frame Size	Trip Rating Amperes	Voltage (AC Rating)	Symmetrical AC Interrupting Capacity
100/2	15 - 100	240	10,000 Min
100/3	15 - 100	240	10,000 Min
225/3	70 - 225	240	65,000 Min
250/3	70 - 250	240	65,000 Min
400/3	250 - 400	240	65,000 Min
600/3	300 - 600	240	65,000 Min
800/3	500 - 800	240	65,000 Min
1200/3	800 - 1200	240	65,000 Min
1600/3	1200 - 1600	240	65,000 Min
2000/3	1800 - 2000	240	65,000 Min

Circuit Breaker Frame Size	Trip Rating Amperes	Voltage (AC Rating)	Symmetrical AC Interrupting Capacity
100/2	15 - 100	480	18,000 Min
100/3	15 - 100	480	18,000 Min
225/3	70 - 225	480	35,000 Min
250/3	70 - 250	480	35,000 Min
400/3	250 - 400	480	35,000 Min
600/3	300 - 600	480	35,000 Min
800/3	500 - 800	480	50,000 Min
1200/3	800 - 1200	480	50,000 Min
1600/3	1200 - 1600	480	50,000 Min
2000/3	1800 - 2000	480	50,000 Min

H. Manufacturer: Cutler-Hammer "POW-R-LINE C", Square D "Power Style", General Electric "AV-Line".

PART 3 EXECUTION

3.01 CLEANING

A. Clean dirt and debris from switchboard enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred surfaces to match original factory finish.

3.02 PROTECTION

A. Protect installed switchboards from subsequent construction operations.

3.03 SWITCHBOARDS

A. Protect switchboards from damage, abuse, dirt and debris during construction. Keep equipment free from dirt, scratches, nicks, blisters and other marks not part of the factory finish. Make touch-ups to the finish with factory enamel.

B. Unless noted on drawing, anchor free standing panels to concrete slabs with 1/2 inch or larger anchor bolts fastened to malleable iron or steel expansion shields in the slab. Submit a detail indicating anchor method.

C. Coordinate all required conduit openings, blockouts, stub-ups, and conduit entrance requirements.

D. Identify conductors with circuit numbers and phase tape.

E. Neatly arrange wiring within the equipment. Bundle and wrap conductors #8 AWG and smaller with plastic wire ties.

F. Install an insulated grounding bushing on conduits which enter the equipment.

END OF SECTION

This page intentionally left blank

SECTION 26 24 16
PANELBOARDS

PART 1 GENERAL

1.01 SUMMARY

A. This section describes requirements for branch circuit panelboards.

1.02 RELATED WORK

A. Section 26 01 00: General Requirements for Electrical Work.

1.03 REFERENCE STANDARDS

A. The Underwriters Laboratory, Inc. (UL).

B. National Electrical Manufacturers Association (NEMA).

1.04 SUBMITTALS

A. Manufacturers Data:
   1. Panelboards.

B. Shop Drawings.
   1. Panelboards.

PART 2 PRODUCTS

2.01 PANELBOARDS - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
   1. Altitude: Less than 6,600 feet (2,000 m).
   2. Ambient Temperature:
      a. Panelboards Containing Circuit Breakers: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).
      b. Panelboards Containing Fusible Switches: Between -22 degrees F (-30 degrees C) and 104 degrees F (40 degrees C).

C. Short Circuit Current Rating:
   1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.

D. Panelboards Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.

E. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.

F. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.

G. Bussing: Sized in accordance with UL 67 temperature rise requirements.
   1. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.

H. Conductor Terminations: Suitable for use with the conductors to be installed.

I. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
   1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
      a. Indoor Clean, Dry Locations: Type 1.
      b. Outdoor Locations: Type 3R.
   2. Boxes: Galvanized steel unless otherwise indicated.
      a. Provide wiring gutters sized to accommodate the conductors to be installed.
   3. Fronts:

a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.
c. Finish for Painted Steel Fronts: Manufacturer's standard grey unless otherwise indicated.

4. Lockable Doors: All locks keyed alike unless otherwise indicated.

J. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

2.02 BRANCH CIRCUIT PANELBOARDS

A. General: Provide bussed, circuit breaker or fusible switch type panelboards with main lugs or circuit breaker in flush or surface mounted enclosures as indicated.

B. Construction:
1. Cabinets: Code gauge steel cabinets, deadfront panels, and doors. Fasten deadfront panels to cabinets with concealed trim fasteners. Conceal front door hinges.
2. Dimensions: 20 inches wide by 6 inches deep.
3. Locks: Flush door locks, keyed alike for all panelboards.
4. Access: Door-in-Door (Not EZ-Trim).
5. Standards: Provide UL label where applicable and conform to No. 67 and 50 Underwriters Laboratories, Inc., and NEMA PB-1.

C. Bussing:
1. Phase Bus: Silver-plated copper, rated 1000 amperes per square inch cross sectional area maximum, braced for 100,000 rms amperes minimum.
2. Neutral Bus: Copper with lugs for connection of neutral conductors.
3. Ground Bus: Copper with terminals for equipment grounding conductors.
4. Terminals: As specified in Section 26 05 19 - Building Wire and Cable.

D. Finish: Degrease, clean, phosphatize, prime, and finish cabinets, deadfront panels, and doors with baked enamel, color ASA-61, or standard factory grey. Galvanized cabinets are acceptable for flush cabinets.

E. Nameplates:
1. Provide a nameplate identifying panelboard in accordance with 26 01 00 - General Requirements for Electrical Work.
2. Provide a manufacturer's nameplate on the deadfront interior panel indicating panelboard type, voltage rating, current rating and manufacturer's name.

F. Directory: Provide a directory card which fits into slots in the back of the panelboard. Protect directory with non-yellowing clear plastic.

G. Manufacturer: Westinghouse (Pow-R-Line 2), General Electric, Square D.

H. Circuit Breakers:
1. Provide circuit breakers for miscellaneous branch circuits with frame sizes and ratings as shown on the plans.
2. Bolt-on, thermal magnetic, molded case, with inverse time current overload, and instantaneous magnetic trips, trip-free and trip-indicating all poles of multi-pole device shall operate simultaneously during open, close and trip operations. Provide circuit breakers indicated with the following ratings:

Panel Type	Circuit Breaker Frame Size	Trip Rating (Amperes)	Voltage (Ac Rating)	Symmetrical AC Interrupting Capacity
1	100/1 pole	15-100	120	10,000 Min
	100/2 & 3 poles	15 – 100	240	10,000 Min
	150/2 & 3 poles	110 - 150	240	18,000 Min
	225/3 poles	125 - 225	240	22,000 Min

Panel Type	Circuit Breaker Frame Size	Trip Rating (Amperes)	Voltage (Ac Rating)	Symmetrical AC Interrupting Capacity
2	100/1 pole	15-100	277	14,000 Min
	100/2 & 3 poles	15 – 100	480	14,000 Min
	150/2 & 3 poles	110 - 150	480	25,000 Min
	225/3 poles	125 - 225	480	25,000 Min

I. Manufacturer: Eaton Cutler-Hammer (Pow-R-Line 2), General Electric, Square D.

PART 3 EXECUTION

3.01 BRANCH CIRCUIT PANELBOARDS

A. Mount panelboard so that the top is 6 feet-6 inches above the finished floor.

B. Neatly terminate conductors onto breaker, ground bus and neutral bus. Train conductors in an organized grouping with conductors fanning out at the circuit terminals, bundled in the wireways and laced with plastic ties.

C. Identify all conductors with a circuit number and phase color.

D. Type all panelboard directories.

E. Provide a minimum of three (3) 3/4-inch empty conduits into accessible ceiling space.

F. Provide insulated grounding bushings on all conduits which enter the cabinet and bond to ground bus.

G. Install conduits in a vertical line, perpendicular to the cabinet.

END OF SECTION

This page intentionally left blank

SECTION 26 27 26
WIRING DEVICES

PART 1 GENERAL

1.01 SUMMARY

A. Provide electrical materials, installation and testing for the project improvements.

1.02 DESCRIPTION

A. This section describes requirements for wiring devices and connections.

1.03 RELATED WORK

A. Section 26 01 00: General Requirements for Electrical Work.

B. Section 26 05 26: Grounding.

C. Basis of design cubicle whip connections and floor box plates.

1.04 REFERENCE STANDARDS

A. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2000.

B. NEMA WD 1 - General Color Requirements for Wiring Devices; National Electrical Manufacturers Association; 1999 (R 2005).

C. NEMA WD 6 - Wiring Device -- Dimensional Requirements; National Electrical Manufacturers Association; 2002.

D. NFPA 70 - National Electrical Code; National Fire Protection Association; 2005.

1.05 SUBMITTALS

A. Submit manufacturers' data and shop drawings in accordance with Division 1.

B. Provide submittals for items listed documenting compliance with specification requirements.

C. Product Data:
   1. Electrical Materials: Manufacturer's current published catalog sheets.

D. Shop Drawings:
   1. Record Basis of Design of cubicle whip connection and floor box finish plate selection.

PART 2 PRODUCTS

2.01 ALL WIRING DEVICES

A. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

2.02 WIRING DEVICES

A. Provide UL listed wiring devices, white or color selected by Engineer, with voltage and current ratings specified and wire terminations designed to contain stranded conductors. Provide grounding type receptacles. Provide RED color for all wiring devices connected to the emergency power system.

B. Provide 120 volt single and duplex receptacles which meet Federal Specification W-C-596 as listed:

1. SPECIFICATION GRADE - COMMERCIAL (DESIGNER)

	HUBBELL	PASS & SEYMOUR	LEVITON
NEMA 5-20R single	#2161	#26341	#16351
NEMA 5-20R duplex	#2162	#26342	#16352

2. SPECIFICATION GRADE - COMMERCIAL

	HUBBELL	PASS & SEYMOUR	LEVITON
NEMA 5-20R single	#5361	#5361	#5361
NEMA 5-20R duplex	#5362	#5362	#5362
NEMA 5-20R duplex with isolated ground	#IG-5362	#IG-6300	#5362-IG
NEMA 5-20R duplex with GFCI	#GF-5362	#2091-S	#6599

3. STANDARD GRADE - COMMERCIAL

	HUBBELL	PASS & SEYMOUR	LEVITON
NEMA 5-20R single	#5351	#5358	#5351
NEMA 5-2OR duplex	#5352	#3232	#5352

C. Provide receptacles other than 120-volt single and duplex as indicated on drawings.

D. Provide 20-amp AC quiet type switches which meet federal specification W-C596 with voltage ratings to suit branch circuit requirements indicated and as listed:

	HUBBELL	PASS & SEYMOUR	LEVITON
Single Pole	1221	20AC	1221
Double Pole	1222	5952	1222
Three Way	1223	20AC3	1223
Four Way	1224	5954	1224
SPST Momentary	1557	5935	1257

E. Listed manufacturers establish a standard of quality. Substitutions will be considered in accordance with Section 26 01 00, General Requirements for Electrical Work.

F. Key Switches: Equivalent to listed switches, activated with removable key.

G. Switch with Pilot Light: Leviton #5226, Bryant #6405, G.E. #7945, or equal.

H. Wall Plates: Type 302 stainless steel, satin finish, minimum 0.040-inch-thick, single or multiple gang.

PART 3 EXECUTION

3.01 WIRING DEVICES

A. Connect wiring devices to circuits indicated using side or back wiring terminals, designed to contain stranded wire.

B. Connect green grounding pigtail from receptacles to outlet box with screw.

C. Install wiring devices flush with the device plate fronts.

D. Align plates plumb with wall, and cover opening, without use of "jumbo" plates.

END OF SECTION

This page intentionally left blank

SECTION 26 28 12
SURGE PROTECTION DEVICES (SPD)

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

A. The General Conditions, Supplementary General Conditions, Special Conditions and Division 1 General Requirements apply to the work of this section.

B. The Contractor shall furnish and install the low voltage Surge Protective Device (SPD) equipment having the electrical characteristics, ratings, and modifications as specified herein and as shown on the drawings. To maximize performance and reliability and to obtain the lowest possible let-through voltages, the ac surge protection shall be integrated into electrical distribution equipment such as switchgear, switchboards, panelboards, busway (integrated within bus plug), or motor control centers. The SPD shall be integrated into the distribution equipment by the manufacturer and sized by manufacturer. Refer to related sections for surge requirements in:

1.02 RELATED WORK

A. Section 26 24 16: Panelboards

1.03 REFERENCE STANDARDS

A. The Underwriters Laboratory, Inc. (UL): SPD units and all components shall be designed, manufactured, and tested in accordance with the latest applicable UL standard (ANSI/UL 1449 3rd Edition).

1.04 SUBMITTALS

A. The following information shall be submitted to the Architect:
   1. Provide verification that the SPD complies with the required ANSI/UL 1449 3rd Edition listing by Underwriters Laboratories (UL) or other Nationally Recognized Testing Laboratory (NRTL). Compliance may be in the form of a file number that can be verified on UL's website or on any other NRTL's website, as long as the website contains the following information at a minimum: model number, SPD Type, system voltage, phases, modes of protection, Voltage Protection Rating (VPR), and Nominal Discharge Current (In).
   2. For sidemount mounting applications (SPD mounted external to electrical assembly), electrical/mechanical drawings showing unit dimensions, weights, installation instruction details, and wiring configuration.

PART 2 PRODUCTS

2.01 SURGE PROTECTION DEVICE

A. SPDs shall Eaton SPD series or equal.

2.02 VOLTAGE SURGE SUPPRESSION-GENERAL

A. Electrical Requirements
   1. Unit Operating Voltage – Refer to drawings for operating voltage and unit configuration.
   2. Maximum Continuous Operating Voltage (MCOV) – The MCOV shall not be less than 115% of the nominal system operating voltage.
   3. The suppression system shall incorporate thermally protected metal-oxide varistors (MOVs) as the core surge suppression component for the service entrance and all other distribution levels. The system shall not utilize silicon avalanche diodes, selenium cells, air gaps, or other components that may crowbar the system voltage leading to system upset or create any environmental hazards.
   4. Protection Modes – The SPD must protect all modes of the electrical system being utilized. The required protection modes are indicated by bullets in the following table:

	Protection Modes			
Configuration	L-N	L-G	L-L	N-G
Wye	●	●	●	●
Delta	N/A	●	●	N/A
Single Split Phase	●	●	●	●
High Leg Delta	●	●	●	●

5. Nominal Discharge Current (In) – All SPDs applied to the distribution system shall have a 20kA In rating regardless of their SPD Type (includes Types 1 and 2) or operating voltage. SPDs having an In less than 20kA shall be rejected.
6. ANSI/UL 1449 3rd Edition Voltage Protection Rating (VPR) – The maximum ANSI/UL 1449 3rd Edition VPR for the device shall not exceed the following:

Modes	208Y/120	480Y/277	600Y/347
L-N; L-G; N-G	700	1200	1500
L-L	1200	2000	3000

B. SPD Design
   1. Maintenance Free Design – The SPD shall be maintenance free and shall not require any user intervention throughout its life. SPDs containing items such as replaceable modules, replaceable fuses, or replaceable batteries shall not be accepted. SPDs requiring any maintenance of any sort such as periodic tightening of connections shall not be accepted. SPDs requiring user intervention to test the unit via a diagnostic test kit or similar device shall not be accepted.
   2. Balanced Suppression Platform – The surge current shall be equally distributed to all MOV components to ensure equal stressing and maximum performance. The surge suppression platform must provide equal impedance paths to each matched MOV. Designs incorporating replaceable SPD modules shall not be accepted.
   3. Electrical Noise Filter – Each unit shall include a high-performance EMI/RFI noise rejection filter. Noise attenuation for electric line noise shall be up to 50 dB from 10 kHz to 100 MHz using the MIL-STD-220A insertion loss test method. Products unable able to meet this specification shall not be accepted.
   4. Internal Connections – No plug-in component modules or printed circuit boards shall be used as surge current conductors. All internal components shall be soldered, hardwired with connections utilizing low impedance conductors.
   5. Monitoring Diagnostics – Each SPD shall provide the following integral monitoring options:
      a. Protection Status Indicators - Each unit shall have a green / red solid-state indicator light that reports the status of the protection on each phase.
         i. For wye configured units, the indicator lights must report the status of all protection elements and circuitry in the L-N and L-G modes. Wye configured units shall also contain an additional green / red solid-state indicator light that reports the status of the protection elements and circuitry in the N-G mode. SPDs that indicate only the status of the L-N and L-G modes shall not be accepted.
         ii. For delta configured units, the indicator lights must report the status of all protection elements and circuitry in the L-G and L-L modes.

iii. The absence of a green light and the presence of a red light shall indicate that damage has occurred on the respective phase or mode. All protection status indicators must indicate the actual status of the protection on each phase or mode. If power is removed from any one phase, the indicator lights must continue to indicate the status of the protection on all other phases and protection modes. Diagnostics packages that simply indicate whether power is present on a particular phase shall not be accepted. The systems individual units shall be UL listed under UL 1449 Standard for TVSS and the surge ratings shall be permanently affixed to the TVSS.

c. Audible Alarm and Silence Button – The SPD shall contain an audible alarm that will be activated under any fault condition. There shall also be an audible alarm silence button used to silence the audible alarm after it has been activated.

d. Surge Counter – The SPD shall be equipped with an LCD display that indicates to the user how many surges have occurred at the location. The surge counter shall trigger each time a surge event with a peak current magnitude of a minimum of 50 ± 20A occurs. A reset pushbutton shall also be standard, allowing the surge counter to be zeroed. The reset button shall contain a mechanism to prevent accidental resetting of the counter via a single, short-duration button press. In order to prevent accidental resetting, the surge counter reset button shall be depressed for a minimum of 2 seconds in order to clear the surge count total.

i. The ongoing surge count shall be stored in non-volatile memory. If power to the SPD is completely interrupted, the ongoing count indicated on the surge counter's display prior to the interruption shall be stored in non-volatile memory and displayed after power is restored. The surge counter's memory shall not require a backup battery in order to achieve this functionality.

6. Overcurrent Protection
   a. The unit shall contain thermally protected MOVs. These thermally protected MOVs shall have a thermal protection element packaged together with the MOV in order to achieve overcurrent protection of the MOV. The thermal protection element shall disconnect the MOV(s) from the system in a fail-safe manner should a condition occur that would cause them to enter a thermal runaway condition.
7. Fully Integrated Component Design – All of the SPD's components and diagnostics shall be contained within one discrete assembly. SPDs or individual SPD modules that must be ganged together in order to achieve higher surge current ratings or other functionality shall not be accepted.
8. Safety Requirements
   a. The SPD shall minimize potential arc flash hazards by containing no user serviceable / replaceable parts and shall be maintenance free. SPDs containing items such as replaceable modules, replaceable fuses, or replaceable batteries shall not be accepted. SPDs requiring any maintenance of any sort such as periodic tightening of connections shall not be accepted. SPDs requiring user intervention to test the unit via a diagnostic test kit or similar device shall not be accepted.
   b. SPDs designed to interface with the electrical assembly via conductors shall require no user contact with the inside of the unit. Such units shall have any required conductors be factory installed.
   c. Sidemount SPDs shall be factory sealed in order to prevent access to the inside of the unit. Sidemount SPDs shall have factory installed phase, neutral, ground and remote status contact conductors factory installed and shall have a pigtail of conductors protruding outside of the enclosure for field installation.

C. Manufacturer: Liebert, Leviton, or approved equal.

PART 3 EXECUTION

3.01 SURGE PROTECTION DEVICE (TVSS)

A. Install the parallel TVSS with short and straight conductors as practically as possible, twist the TVSS input conductors together to reduce input conductor inductance and follow the manufacturers recommended installation practices and comply with all applicable codes.

END OF SECTION

SECTION 26 28 18
ENCLOSED SWITCHES

PART 1 GENERAL

1.01 SUMMARY

A. Provide electrical materials, installation and testing for the interior and exterior improvements in the project.

1.02 DESCRIPTION

A. This section describes requirements for fused and non-fused disconnects.

1.03 RELATED WORK

A. Section 26 01 00: General Requirements for Electrical Work.

1.04 REFERENCE STANDARDS

A. NEMA FU 1 - Low Voltage Cartridge Fuses; National Electrical Manufacturers Association; 2002.

B. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum); National Electrical Manufacturers Association; 2001.

C. NETA STD ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems; International Electrical Testing Association; 2009.

1.05 SUBMITTALS

A. Provide submittals for items listed documenting compliance with specification requirements.

B. Product Data:
   1. Electrical Materials: Manufacturer’s current published catalog sheets.

PART 2 PRODUCTS

2.01 DISCONNECTS, FUSED AND NON-FUSED

A. Where indicated, provide horsepower rated disconnect switches, pad-lockable in the open position.

B. Three Phase Switches (over 10 horsepower):
   1. Fused or non-fused, as indicated, 600 VAC, heavy duty type safety switches, mounted in NEMA 1 general purpose enclosures in dry locations and NEMA 3R rain-tight enclosures in damp or wet locations, Westinghouse "H600", General Electric "Type TH", Square D "Heavy Duty" or equal.
   2. Clearly indicate on the switch enclosure the "on" and "off" positions.
   3. Mechanisms, quick-make, quick-break.
   4. Door interlock, defeatable to facilitate access into the switch enclosure with the switch in the closed position. Equip fusible switches with Class R fuse rejection clips.

C. Single Phase Switches (non-fused):
   1. 120/240 VAC, general duty type safety switches, mounted in NEMA 1 general purpose enclosures in dry locations and NEMA 3R rain-tight enclosures in damp or wet locations, Cutler Hammer "DG", General Electric "Spec-Setter TG", Square D "Class 3130" or equal.
   2. Clearly indicate on the switch enclosure the "on" and "off" positions.
   3. Mechanisms, quick make, quick break
   4. Door interlock, defeatable to facilitate access into the switch enclosure with the switch in the closed position.

PART 3 EXECUTION

3.01 DISCONNECT SWITCHES

A. Install disconnect switches where indicated. Provide all mounting hardware and accessories.

B. Provide a flexible connection from the disconnect switch to the motor unless otherwise indicated.

C. Attach disconnect switches with specified anchors.

D. Apply phase tape and identify circuit numbers as specified.

E. Install fuses where indicated or when required by UL listing of equipment.

END OF SECTION

SECTION 26 51 00
INTERIOR LIGHTING

PART 1 GENERAL

1.01 SUMMARY

A. This section describes requirements for lighting fixtures, lamps, ballasts and accessories.

B. Provide lighting equipment, installation and testing for the project improvements.

1.02 DESCRIPTION

A. Provide all equipment and materials for a complete lighting system as described herein and as shown on the plans.

1.03 RELATED REQUIREMENTS

A. Section 26 01 00: General Requirements for Electrical Work.

B. Section 26 09 23: Lighting Control Devices

1.04 SUBMITTALS

A. Provide submittals for item listed documenting compliance with specification requirements.

B. Product Data:
   1. Lighting Fixtures: Manufacturer's current published catalog sheets, including photometric information, size, weight, finishes and accessories.
   2. Ballasts: Manufacturer's current published catalog sheets including electrical and lighting performance characteristics.

C. Warranties: Manufacturer's certified warranty documentation.

D. Shop Drawings:
   1. Lighting Fixtures.
   2. Photometric Calculations.
   3. Interconnection schematic diagram between luminaires and controls.

PART 2 PRODUCTS

2.01 LUMINAIRES

A. Provide products that comply with requirements of NFPA 70.

B. Provide products that are listed and labeled as complying with UL 1598, where applicable.

C. Provide products that comply with requirements of NFPA 70 and NFPA 101.

D. Provide products listed, classified, and labeled as suitable for the purpose intended.

E. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

F. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.

G. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

2.02 LIGHTING FIXTURES

A. General: Provide fixtures as indicated, factory wired, ready for field connection.

B. Provide recessed fixtures with complete mounting hardware and trims to suit the type of ceiling in which they are installed. Provide access to lamps and ballasts in recessed fixtures through the lensed door or fixture opening, without requiring removal of fixture.

C. Equip recessed incandescent, compact fluorescent and high intensity discharge fixtures with a factory wired junction box and flexible conduit to fixture housing, when available.

D. Equip pendant mounted fixtures with stems, ball aligners, canopies, swivel hangers, safety cable and all mounting hardware required to conform to State of California seismic safety standards.

E. For surface mounted fixtures provide all blocking, mounting channels required and hardware for mounting.

F. Provide fixtures Underwriters Laboratories, Inc. (UL) approved for installation against low density ceilings where applicable. Do not use spacers.

G. Lamp Holders: Equip fluorescent fixtures with exposed lamps and bipin sockets with socket type lamp holders at each socket. For fluorescent fixtures with exposed lamps and single hole sockets, provide two clamp type lamp holders of the type which bolt to the fixture body and in which the lamp is seated in a spring steel clamp.

2.03 LAMPS

A. Provide lamps as indicated on the fixture schedule, as manufactured by General Electric, Osram Sylvania, or Philips. Supply lamps from one manufacturer.
   1. Fluorescent Lamps:
      a. T-8, medium bi-pin base.
      b. Compact Fluorescent (Preheat), various bases.
   2. Metal Halide Lamps: Any burning position.
   3. Mercury Vapor Lamps: Any burning position.
   4. High Pressure Sodium Lamps: Any burning position.
   5. Incandescent Lamps:
      a. Mogul base.
      b. Watts, D.C. Bay base.

2.04 ELECTRONIC BALLASTS

A. Internally protect fluorescent and high intensity discharge ballasts with automatic reset thermal protectors.

B. Fluorescent Ballasts: Provide UL listed, Environmental Technology Laboratory (ETL) certified, Class P, Class "A" ambient sound-rated, electronic ballasts. Affix UL labels to each ballast. Provide dedicated ballasts for operating the number and type of lamps in rapid start (RS) or instant start (IS) mode as specified below at a frequency of operation of 20 KHz or greater.

No. of Lamps	Lamp Type	Lamp Watts	Line Voltage	Line Amperes	Input Watts
(2)-T8	F17T8	17	120	0.32	33
(3)-T8	F17T8	17	120	0.51	53
(4)-T8	F17T8	17	120	0.61	63
(2)-T8	F17T8	17	277	0.14	33
(3)-T8	F17T8	17	277	0.23	53
(4)-T8	F17T8	17	277	0.27	63
(2)-T8	F25T8	25	120	0.47	48
(3)-T8	F25T8	25	120	0.66	68
(4)-T8	F25T8	25	120	0.86	89
(2)-T8	F25T8	25	277	0.21	48
(3)-T8	F25T8	25	277	0.29	68
(4)-T8	F25T8	25	277	0.39	89
(2)-T8	F32T8	32	120	0.60	62
(3)-T8	F32T8	32	120	0.87	89
(4)-T8	F32T8	32	120	1.12	114
(2)-T8	F32T8	32	277	0.27	62
(3)-T8	F32T8	32	277	0.38	89
(4)-T8	F32T8	32	277	0.48	114
(2)-T8	F40T12/RS	40	120	0.68	69
(3)-T8	F40T12/RS	40	120	1.10	103
(2)-T8	F40T12/RS	40	277	0.29	69
(3)-T8	F40T12/RS	40	277	0.44	103
(2)-T8	F96T12/IS	75	120	1.39	135
(2)-T8	F96T12/IS	75	277	0.60	135

C. Provide ballasts with the following characteristics:
   1. Power factor: 97 percent or greater.
   2. Ballast factor: 90 percent or greater
   3. Regulation: For a voltage variation of +/- 10 percent of line voltage, maintain light output within +/- 10 percent.
   4. Lamp current crest factor: Less than 1.7.
   5. Percent flicker: 10 percent or less.
   6. Harmonics: Provide ballasts that limit the third harmonic to less than 15 percent and have a total harmonic distortion of less than 20 percent.

D. Provide dual-rated 120/277 volt ballasts.

E. Provide two-lamp ballasts, unless otherwise indicated or required.

F. The manufacturer shall have been in business for a minimum of five (5) years and shall have a three (3) year warranty with up to $10.00 replacement labor allowance. Provide ballast as manufactured by Advance, MagneTek Universal, or Osram Sylvania. Supply ballasts from one manufacturer.

G. Regulatory Requirements:
   1. Furnish ballasts which:
      a. Do not contain polychlorinated biphenyl (PCB) type material.

b. Meet FCC Rules and Regulations, Part 18.
c. Meet minimum efficacy standards of Public Law No. 100-357, National Appliance Energy Conservation Amendments of 1988.
d. Withstand line transients as defined in Institute of Electrical and Electronic Engineers (IEEE) Publication 587, Category A.

H. Fluorescent Emergency Ballast: Emergency lighting shall be provided by using a standard fluorescent fixture equipped with an UL listed factory installed emergency ballast.
1. T12, U-shaped, HO, and VHO lamps: Provide high temperature, maintenance-free, field-replaceable nickel cadmium battery, a charger, and electronic circuitry at full illumination for a minimum of 90 minutes in the emergency mode. A solid-state charging indicator light to monitor the charger and battery, double-pole test switch and installation hardware shall be provided. The emergency ballast shall have 8W (standby) or 15W (high rate) of input power and 57.6 watt-hour battery capacity, and exceed emergency standards set forth by the NEC.
2. Twin tube and quad compact fluorescent lamps: Provide a special high temperature, maintenance-free, field-replaceable nickel cadmium battery, a charger, and electronic circuitry. A solid-state charging indicator light to monitor the charger and battery, test switch and installation hardware shall be provided. The emergency ballast shall be capable of operating one 6W-28W fluorescent lamp without an integral starter at reduced illumination for a minimum of 90 minutes in the emergency mode. Initial emergency light output for quad-tube lamps shall be 650 lumens for a 26W lamp, 550 lumens for an 18W lamp, 550 lumens for a 13W lamp, and 300 lumens for a 10W lamp, and for long compact fluorescent lamps shall be 600 lumens for a 27W lamp, 750 lumens for a 24W lamp and 500 lumens for 18W lamps. It shall have 3.5 watts of input power and a 14.4 watt-hour battery capacity, and comply with emergency standards set forth by the current National Electrical Code (NEC). The emergency ballast shall be UL listed for installation either inside or on top of the fixture and be warranted for a full two years from date of purchase.
3. Manufacturer: Bodine

I. High Pressure Sodium Ballasts:
1. High power factor type UL 1029.
2. Wattage Spread: Not to exceed 18 percent for a line voltage variation of +/- 10 percent.
3. Power Factor: Not less than 90 percent throughout rated lamp life for a line voltage variation of +/- 10 percent.
4. Provide no more than a plus or minus 8 percent variation in voltage throughout rated lamp life for a variation in manufacturing tolerance for ballast capacitors of ± 6 percent.
5. Crest Factor: Not to exceed 1.8 for +/- 10 percent variation in line voltage.
6. Ballast operation with open or short circuit condition: Six months without significant loss of ballast life, based on an average design life of 100,000 hours.
7. Submit certificates of compliance and tests of lamp-ballast combination for power factor, wattage and voltage regulation, crest factor and operation of ballast with open or short circuit condition.

J. Metal Halide Ballasts:
1. Provide high power factor lead-peaked ballasts of the wattage indicated.
2. Wattage Spread: Not to exceed plus or minus 10 percent for a voltage variation of +/- 10 percent.
3. Provide encased ballasts in interior locations.

K. Mercury Vapor Ballasts:
1. Provide high power factor constant-wattage autotransformer ballasts of the wattage indicated.
2. Wattage Spread: Not to exceed +/- 5 percent for a voltage variation of +/- 10 percent.
3. Provide encased ballasts in interior locations.

L. Temperature: Provide ballasts suitable for starting temperatures encountered. In exterior and non-heated locations provide ballasts suitable for operation down to 0 degrees F.

2.05 LED LUMINAIRES

A. Components: UL 875 recognized or listed as applicable.

B. Tested in accordance with IES LM-79 and IES LM-80.

C. LED estimated useful life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

D. 90 CRI minimum indoor.

E. Kelvin Temperature as specified on Construction Documents.

2.06 EMERGENCY LIGHTING UNITS

A. Description: Emergency lighting units complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.

B. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.

C. Battery:
   1. Size battery to supply all connected lamps, including emergency remote heads where indicated.

D. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.

E. Provide low-voltage disconnect to prevent battery damage from deep discharge.

F. Self-diagnostics: provide units that self-monitor functionality and automatically perform testing required by NFPA 101 where indicated; provide indicator light(s) to report test and diagnostic status.

G. Accessories:
   1. Provide compatible accessory mounting brackets where indicated or required to complete installation.
   2. Provide compatible accessory high impact polycarbonate vandal shields where indicated.
   3. Provide compatible accessory wire guards where indicated.
   4. Where indicated, provide emergency remote heads that are compatible with the emergency lighting unit they are connected to and suitable for the installed location.

2.07 EXIT SIGNS

A. Description: internally illuminated exit signs with LEDs unless otherwise indicated; complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.
   1. Number of faces: single or double as indicated or as required for the installed location.
   2. Directional arrows: as indicated or as required for the installed location.

B. Self-powered exit signs:
   1. Operation: upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.
   2. Battery: sealed maintenance-free nickel cadmium unless otherwise indicated.
   3. Diagnostics: provide power status indicator light and accessible integral test switch to manually activate emergency operation.
   4. Self-diagnostics: provide units that self-monitor functionality and automatically perform testing required by NFPA 101 where indicated; provide indicator light(s) to report test and diagnostic status.

C. Accessories:
   1. Provide compatible accessory high impact polycarbonate vandal shields where indicated.

2. Provide compatible accessory wire guards where indicated.

PART 3 EXECUTION

3.01 LIGHTING FIXTURES

A. Install lighting fixtures complete with lamps, ready for operation.

B. Secure fixtures to the structure by means of brackets, flanges another mounting hardware suited for the fixtures and type of installation.

C. Connect recessed fixtures with flexible metal conduit and fixture tap wire as specified in Section 26 05 34 - Conduit and 26 05 19 - Building Wire and Cable.

D. Secure surface mounted fixtures with a minimum of (2) 1/4 inch bolts, or as detailed.

E. Secure recessed fluorescent fixtures with a minimum of 2 #12 AWG hanger wires, independent of ceiling hangers.

3.02 SIESMIC LIGHTING BRACING

A. Firmly attach items weighing less than 20 pounds to main cross runners. Two 12 gauge support wires to the ceiling system hangers or structure shall be included for items from 20 to 56 pounds. Directly support items over 56 pounds from the structure above with approved hangers

3.03 CLEANING

A. Clean lighting fixtures prior to final acceptance.

END OF SECTION

SECTION 26 56 00
EXTERIOR LIGHTING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Exterior luminaires with lamps and drivers.
   2. Luminaire supports.
   3. Luminaire-mounted photoelectric relays.

B. Related Documents & Sections:
   1. Drawings and general provisions of the Contract apply to the work of this Section.
   2. Division 26 General Requirements of Electrical Work sections apply to work in this Section.

C. Coordination Requirements:
   1. Coordinate the installation of all light fixtures. This includes but is not limited to placement of fixtures in conjunction with civil work such as sidewalks, roadways, parking lots, landscaping, and building exteriors.
   2. Coordinate the installation of all light fixtures with mounting surfaces fixtures that light will be mounted within, onto, or through. Coordinate placement of fixture supports, anchors and mounts.

1.02 SUBMITTALS

A. Product Data: For each type of light fixture, arranged in order of fixture designation. Include data on features, accessories, and finishes.
   1. Submit manufacturer's product datasheet on each and every light fixture.
   2. Furnish shop drawing portfolios (collated & bound sets) containing the following information:
      a. Name of manufacturer, make, and model of each particular fixture in the project.
      b. Product listing information (UL, ETL, DLC, Dark Sky, etc…)
      c. Descriptive cut sheets. Indicate fixture catalog number selections, highlight, or make obvious which part numbers are used to build the complete fixture catalog number.
      d. Complete photometric information and coefficient utilization tables.
      e. Fixture voltage, match to project specifics.
      f. Wiring diagrams for power, control, and signal wiring.
      g. Photoelectric relays and how they interconnect into the system schematically.
      h. The number, type, and wattage of the fixture lamps. Include lamp rated life, color temperature, color rending index (CRI), initial & mean lumen output.
      i. The wattage and illumination information for LED fixtures. Include rated life, color temperature, CRI, initial & mean lumen output of LED fixtures.
      j. Lens information including type, pattern, thickness, material type, special features.
      k. Fixture options, mounting details and ceiling compatibility information.
      l. Construction of fixture housing and door, door type, access hole information.
      m. Fixture ballast and driver manufacturer and type information.
      n. Means of attaching luminaries to supports and indication that the attachment is suitable for components involved.
   3. Submit all lighting fixtures required to be used on this project in one single submittal so that all fixtures can be reviewed one at a time. Those fixtures not receiving a shop drawing action of "No exception taken" or "Furnish as corrected" on the first submittal will be resubmitted for review. A light fixture receiving a shop drawing action of "Revise as noted and resubmit" or "Submit specified item" after the third review for any reason, must be furnished as originally specified.

4. Create the portfolios from standard manufacturer's specification sheets. Identify each fixture by the letter or number indicated on the fixture schedule or project plan sheets as applicable. The combining of more than one fixture type of fixture on a single shell is unacceptable.

B. Shop Drawings for nonstandard or custom lighting fixtures: Show details indicating dimensions, weights, methods of field assembly, components, features, and accessories. Product Certificates: For each type of ballast and driver, dimmer-controlled fixtures, provided by manufacturer.

C. Product Schedule: For all luminaires and lamps, using the same designations as on the Project Drawings.

D. Qualification Data: For testing laboratory providing photometric data for luminaires.

E. Product Certificates: For each luminaire type and for each photoelectric relay type.

F. Product Test Reports: For each luminaire, for tests performed by a qualified testing agency. Provide all applicable source quality-control reports.

G. Operation and Maintenance Data: Instructions for each product including information on replacement parts.

H. Provide all applicable field quality-control reports.

I. Project Record Documents: Record actual connections and locations of luminaires and any associated remote mounted components. Provide this information along with project 'as-builts' per the contract documents plans and specifications.

J. Warranty: Provide a copy of the sample warranty prior to commencement of work. Include a copy of the final approved warranty in the project close out documentation.

1.03 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC/NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with IEEE C2, "National Electrical Safety Code."

C. Comply with CEC/NFPA 70.

D. Manufacturers: Firms regularly engaged in the manufacturer of interior and exterior light fixtures of types and ratings required, whose products have been in satisfactory use in similar service for not less than three (3) years.

E. Installer: Qualified with at least three (3) years of successful installation experience on projects with interior and exterior lighting fixture work similar to that required for this project.

F. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturers' laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.

G. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products and complying with applicable IES test standards.

H. Provide luminaires from a single manufacturer for each luminaire type.

I. Mockups: As required on a project-by-project basis (typically not required) for exterior luminaires, complete with power and control connections.
   1. Obtain Owner's approval of luminaires in mockups before starting installations.
   2. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed work.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.04 REFERENCES

A. California Electrical Code (CEC) Compliance: Comply with the CEC (NFPA 70) as applicable to the installation and construction of lighting fixtures.

B. NEMA Compliance: Comply with applicable requirements of NEMA Standard Pub. Nos. LE-1 and LE-2 pertaining to lighting equipment.

C. ANSI/UL Compliance: Comply with ANSI/UL Standards pertaining to interior and exterior lighting fixtures for hazardous locations. ANSI C82.11 – American National Standard for Lamp Ballasts – High Frequency Fluorescent Lamp Ballasts – Supplements.

D. IEEE C62.41.2 – Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits.

E. .IESNA LM-79 – Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products; Illuminating Engineering Society.

F. IESNA LM-80 – Approved Method: Measuring Lumen Maintenance of LED Light Sources.

G. NECA 1 – Good Workmanship in Electrical Construction, latest edition.

H. NECA/IESNA 501 – Standard for Installing Exterior Lighting Systems, latest edition.

I. Underwriter's Laboratories (UL) Listings. Provide fixtures that have been UL Listed and labeled to any or all of the following standards as applicable to the project:
   1. UL 844 – Luminaires for Use in Hazardous (Classified) Locations.
   2. UL 924 – Emergency Lighting and Power Equipment.
   3. UL 1598 – Luminaires.
   4. UL 8750 – Light Emitting Diode (LED) Equipment for Use in Lighting Products.

1.05 DELIVERY, STORAGE, AND PROTECTION

A. Received, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 501 (exterior lighting), NECA/IESNA 502 (industrial lighting), and all manufacturer's written instructions.

B. Keep fixtures in original product packaging until ready for installation. Do not leave unpackaged fixtures unattended or where they are subject to dirt, debris, or damage.

C. Keep all fixtures warm, dry, safe, and secure. Adhere to manufacturer storage requirements.

D. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering prior to shipping.

1.06 WARRANTY

A. Provide a five (5) year manufacturer warranty for all exterior fixtures, LED drivers, and LED light boards (light engines) from date of substantial completion of the project. This warranty to cover all product defects, performance criteria, and parts.

B. Manufacturer and installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures, including luminaire support components.
      b. Faulty operation of luminaires and accessories.
      c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

PART 2 PRODUCTS

2.01 FIXTURES, GENERAL

A. Provide all fixtures with UL or other qualified third party listed for the environment where they will be installed including: damp, wet, extreme temperature, or hazardous locations.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Luminaires must comply with UL 1598 and be listed and labeled for installation in wet locations by an NRTL acceptable to authorities having jurisdiction.

D. Metal Parts: Free of burrs and sharp corners and edges.

E. Sheet Metal Components: Corrosion-resistant aluminum unless otherwise indicated. Form and support to prevent warping and sagging.

F. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed luminaires.

G. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Provide removable doors for cleaning or replacing lenses. Designed to disconnect ballast when door opens.

H. Exposed Hardware Material: Stainless steel.

I. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

J. Light Shields: Metal baffles, factory installed and field adjustable, arranged to block light distribution to indicated portion of normally illuminated area of field.

K. Provide reflecting surfaces with minimum reflectance as follows unless otherwise indicated:
   1. White Surfaces: 85 percent.
   2. Specular Surfaces: 85 percent.
   3. Diffusing Specular Surfaces: 75 percent.

L. Lenses and Refractors Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.

M. Luminaire Finish: Manufacturer’s standard paint applied to factory-assembled and -tested luminaire before shipping. Where, indicated, match finish process and color of pole or support materials.

N. Variations in Luminaire Finishes: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved samples and are assembled or installed to minimize contrast.

O. Diffusers and Globes:
   1. Acrylic Diffusers: 100 percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
   2. Glass: Annealed crystal glass unless otherwise indicated.
   3. Lens Thickness: At least 0.125 (3.175 mm) minimum unless otherwise indicated.

P. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps and ballasts. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

1. Provide label with the following lamp and ballast characteristics:
   a. “USES ONLY” and include specific lamp type.
   b. Lamp diameter, shape, size, wattage and coating.
   c. CCT and CRI for all luminaires.

Q. Seismic Performance: Label luminaires and lamps as vibration and shock resistant to withstand common vibrations encountered at installation site.
   1. The term “withstand” means “the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified and the luminaire will be fully operational during and after the seismic event.”

2.02 MANUFACTURERS

A. Manufacturers: As noted on the drawings by notes and/or by the light fixture schedule on drawings.

2.03 LUMINAIRE SUPPORT COMPONENTS

A. Comply with all manufacturer written instructions for the physical characteristics and installation procedures.

2.04 LED LIGHTING FIXTURES

A. Provide complete LED lighting fixtures for general illumination that have been tested by IES LM-79 and LM-80 requirements.

B. Provide LED light fixtures that are fabricated, assembled, and manufactured as a complete fixture unit, including housing, mounting hardware, driver, light boards (light engines), and lens.

C. Provide LED lighting fixtures that allow for separate replacement of the light boards and driver. In other words, “throw away” fixtures with non-replaceable components are not permitted.

D. Provide LED lighting fixtures capable of continuous dimming as a standard offering. Dimming range to be from 100% to at least 20% of rated lumen output. Provide dimming control of 0-10VDC.

E. Provide all LED fixture control devices compatible with the type of drivers and dimming requirements of the particular project and coordinated with the light fixture submittals prior to ordering.

F. Provide universal input voltage (120-277 VAC) drivers for all LED applications.

2.05 LED DRIVERS

A. Provide drivers that operate from a 60Hz input AC voltage from 120V-277V. Provide unit with an input voltage tolerance range of at least +/- 10%.

B. The Total Harmonic Distortion (THD) of the driver input current must be no more than 20% when operating at nominal input voltage.

C. Provide drivers with a minimum Power Factor (PF) of 0.90.

D. Provide drivers that comply with ANSI C62.41 Category A for transient voltage protection.

E. Drivers must comply with requirements of the FCC rules and regulations, Title 47 CFR Part 18, Non-consumer (Class A) for EMI and EMF (conducted and radiated) interference.

2.06 LED BOARDS

A. Rated minimum life of 60,000 hours minimum per IES LM-70 testing requirements.

B. Provide a TM21 report on LED boards to be used which tests LED life and lumen maintenance per the IES LM-80 standard, and LED light output and efficacy per the IES LM-70 standard.

C. Provide a correlated color temperature (CCT) of the LEDs of 4000K unless noted otherwise. Provide uniform CCT for all LED modules within like luminaire types and luminaires within a given project.

D. Provide LED boards such that any individual LED failure on a section of LED board within the fixture will not result in significant output loss of the overall fixture.

2.07 LUMINAIRE-MOUNTED PHOTOELECTRIC RELAYS

A. Comply with UL 773 or UL 773A.

B. Contact Relays: Factory mounted, single throw, designed to fail in the on position, and factory set to turn light unit on at 1.5 to 3 fc (16 to 32 lx) and off at 4.5 to 10 fc (48 to 108 lx) with 15-second minimum time delay. Provide relay with directional lens in front of photocell to prevent artificial light sources from causing false turnoff.
   1. Relay with locking-type receptacle must comply with ANSI C136.10.
   2. Adjustable window slide for adjusting on-off set points.

2.08 POLES

A. Manufacturers: As indicated in the luminaire schedule.

B. All Poles:
   1. Provide poles and associated support components suitable for the luminaire(s) and associated supports and accessories to be installed.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for luminaire electrical conduit to verify actual locations of conduit connections before luminaire installation.

C. Examine walls, roofs, canopy ceilings, and overhang ceilings for suitable conditions where luminaires will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 LUMINAIRE INSTALLATION

A. Install lamps in each luminaire.

B. Fasten luminaire to indicated structural supports. Additional support requirements include:
   1. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.
   2. Sized and rated for luminaire weight. Able to maintain luminaire position after cleaning and relamping.
   3. Support luminaires without causing deflection of finished surface.
   4. Luminaire-mounting devices must be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.

C. Wall-Mounted Luminaire Support:
   1. Attach to structural members in walls.

D. Wiring Method: Install cables in raceways. Conceal raceways and cables.

E. Install luminaires level, plumb, and square with finished grade unless otherwise indicated. Install luminaires at height and aiming angle as indicated on Drawings.

F. Coordinate layout and installation of luminaires with other construction.

G. Adjust luminaires that require field adjustment or aiming. Include adjustment of photoelectric device to prevent false operation of relay by artificial light sources, favoring a north orientation.

H. Comply with requirements in Sections “LV Electrical Power Conductors and Cables 600V,” “Conduit” and “Grounding & Bonding for Electrical Systems” for wiring connections and wiring methods.

3.03 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.

B. Steel Conduits: Comply with Section “Conduit.” In concrete foundations, wrap conduit with 0.010-inch- (0.254-mm-) thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.04 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals per Section “Identification for Electrical Systems.”

3.05 FIELD QUALITY CONTROL

A. Inspect each installed luminaire for damage. Replace damaged luminaires and components.

B. Perform the following tests and inspections:
   1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
   2. Verify operation of photoelectric controls.

C. Illumination Tests:
   1. Measure light intensities at night. Use photometers with calibration referenced to NIST standards. Comply with the following IES testing guide(s):
      a. IES LM-5
      b. IES LM-50
      c. IES LM-52
      d. IES LM-64
      e. IES LM-72
   2. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.

D. Luminaire will be considered defective if it does not pass tests and inspections.

E. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

3.06 DEMONSTRATION

A. Train Owner’s maintenance personnel to adjust, operate, and maintain luminaires and photocell relays.

3.07 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.
   1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
   2. Parts and supplies shall be manufacturer’s authorized replacement parts and supplies.
   3. Adjust the aim of luminaires in the presence of the Owner.

END OF SECTION

SECTION 27 08 00

COMMISSIONING OF COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section includes requirements for commissioning facility communications systems, related subsystems and related equipment. This Section supplements general requirements specified in Section 01 91 13, GENERAL COMMISSIONING REQUIREMENTS.

B. Complete list of equipment and systems to be commissioned is specified in Section 01 91 13, GENERAL COMMISSIONING REQUIREMENTS.

C. Commissioned Systems:
   1. Commissioning of systems specified in Division 27 // and 28 // is part of project's construction process including documentation and proof of performance testing of these systems, as well as training of Owner 's Operation and Maintenance personnel in accordance with requirements of Section 01 91 13, GENERAL COMMISSIONING REQUIREMENTS and Division 27, in cooperation with Government and Commissioning Agent.
   2. The facility exterior closure systems commissioning includes communications systems listed in Section 01 91 13 GENERAL COMMISSIONING REQUIRMENTS.

1.02 RELATED WORK

A. Construction phase commissioning process and procedures including roles and responsibilities of commissioning team members and user training: Section 01 91 13, GENERAL COMMISSIONING REQUIREMENTS.

1.03 COORDINATION

A. Commissioning Agent will provide a list of submittals that must be reviewed by Commissioning Agent simultaneously with engineering review; do not proceed with work of sections identified without engineering and Commissioning Agent's review completed.

B. Commissioning of communications systems require inspection of individual elements of communications system construction throughout construction period. Coordinate with Commissioning Agent in accordance with Section 01 91 13, GENERAL COMMISSIONING REQUIREMENTS and commissioning plan to schedule communications systems inspections as required to support the commissioning process.

1.04 CLOSEOUT SUBMITTALS

A. Refer to Section 01 91 13, GENERAL COMMISSIONING REQUIREMENTS for submittal requirements for pre-functional checklists, equipment startup reports, and other commissioning documents.

B. Pre-Functional Checklists:
   1. Complete pre-functional checklists provided by commissioning agent to verify systems, subsystems, and equipment installation is complete and systems are ready for Systems Functional Performance Testing.
   2. Submit completed checklists to Contracting Officer's Representative (COR) and to Commissioning Agent. Commissioning Agent can spot check a sample of completed checklists. If Commissioning Agent determines that information provided on the checklist is not accurate, Commissioning Agent then returns the marked-up checklist to Contractor for correction and resubmission.
   3. If Commissioning Agent determines that a significant number of completed checklists for similar equipment are not accurate, Commissioning Agent can select a broader sample of checklists for review.

4. If Commissioning Agent determines that a significant number of broader sample of checklists is also inaccurate, all checklists for the type of equipment will be returned to Contractor for correction and resubmission.

C. Submit training agendas and trainer resumes in accordance with requirements of Section 01 91 13, GENERAL COMMISSIONING REQUIREMENTS.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 FIELD QUALITY CONTROL

A. Contractor's Tests:
   1. Scheduled tests required by other sections of Division 27 must be documented in accordance with GENERAL REQUIREMENTS.
   2. Incorporate all testing into project schedule. Provide minimum seven calendar days' notice of testing for Commissioning Agent to witness selected Contractor tests at sole discretion of Commissioning Agent.
   3. Complete tests prior to scheduling Systems Functional Performance Testing.

B. Systems Functional Performance Testing:
   1. Commissioning process includes Systems Functional Performance Testing that is intended to test systems functional performance under steady state conditions, to test system reaction to changes in operating conditions, and system performance under emergency conditions.
   2. Commissioning Agent prepares detailed Systems Functional Performance Test procedures for review and acceptance by COR.
   3. Provide required labor, materials, and test equipment identified in test procedure to perform tests.
   4. Commissioning Agent must witness and document the testing.
      a. Provide test reports to Commissioning Agent. Commissioning Agent will sign test reports to verify tests were performed.

3.02 TRAINING

A. Training of operation and maintenance personnel is required in cooperation with COR and Commissioning Agent.

B. Provide competent, factory authorized personnel to provide instruction to operation and maintenance personnel concerning location, operation, and troubleshooting of installed systems.

C. Schedule instruction in coordination with COR after submission and approval of formal training plans.

D. Provide 16 hours of training at the Owner’s convenience after communications system has been installed and commissioned.

END OF SECTION

This page intentionally left blank

SECTION 27 10 05
STRUCTURED CABLING FOR VOICE AND DATA - INSIDE-PLANT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Communications system design requirements.

B. This section describes requirements for the installation of the communication cabling system and telecommunication outlets:
   1. Telecommunications service entrance to building(s).
   2. Cabling and pathways inside building(s).
   3. Cabling and pathways connecting building(s).
   4. Distribution frames, cross-connection blocks, patch panels, enclosures, and outlets.
   5. Grounding and bonding the telecommunications distribution system.
   6. Labeling Requirements.

1.02 RELATED REQUIREMENTS

A. Section 26 01 00: General Requirements for Electrical Work.

B. Section 26 05 34: Conduit

C. Section 26 05 29: Hangers and Supports for Electrical Systems

D. Section 26 05 37: Boxes

E. Section 26 05 19: Low-Voltage Electrical Power Conductors and Cables

F. Section 26 27 26: Wiring Devices

G. Section 26 28 18: Enclosed Switches

H. Section 26 05 32: J-Hooks

1.03 CODES AND STANDARDS

A. Comply with the current applicable standards of the listed agencies for the telecommunication cabling system installation, City of Stockton's "NET - Telecom Standards 20200609vj.pdf".

B. American National Standards Institute (ANSI)/ Telecommunications Industry Association (TIA)/ Electronic Industries Alliance Standards:
   1. ANSI/TIA/EIA-526-14 Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant (latest).
   2. NSI/TIA/EIA-568-C: Commercial Building Telecommunications Wiring (latest).
   3. ANSI/TIA/EIA-569: Commercial Building Standard for Telecommunications Pathways and Spaces (latest).
   4. ANSI/TIA/EIA-598-C: Optical Fiber Cable Color Coding (latest).
   5. ANSI/TIA/EIA-606-B (latest): Administrations Infrastructure of Commercial Buildings
   6. ANSI/TIA/EIA-607: Commercial Building Grounding and Bonding Requirements for Telecommunications (latest).
   7. ANSI/TIA/EIA-758: Customer Owned Outside Plant Telecommunication Infrastructure Standard (latest).

C. Building Industry Consulting Services International (BICSI) Telecommunications Distribution Methods Manual (latest).

D. Americans with Disabilities Act (ADA)

E. FCC Part 58.500.

F. California Title 24 codes, including the California electrical Code (CEC), all federal, state, and local codes, regulations and standards

G. Underwriters Laboratories (UL): Applicable listings and ratings.

H. As-Built record drawings

1.04 SUBMITTALS

A. Product Data: Include data on features, ratings, and performance for each component specified. Catalog cut sheets shall be provided for the following:
   1. Wire, cable, cords and optical fiber
   2. Outlets, jacks, faceplates, and connectors
   3. Terminal blocks and patch panels
   4. Enclosures, racks, and equipment housings, wire management
   5. Protectors
   6. Splice housings
   7. Accessories
   8. Firestop
   9. Other items to be used

B. Shop Drawings: Submit drawings within 30 days of award of contract for Engineers review and approval. For this purpose, request from the Architect the AutoCAD backgrounds and electrical drawings. Provide 1 full size hardcopy drawing set and PDF soft copy. Provide T series shop drawings prepared by AutoCad using the same format as the project CD drawings per TIA 606-B Annex

   1. T0- Campus or site Plans- exterior pathways and campus cabling
   2. T1-Layout of complete building per floor- Cabling pathways and zoning
   3. T2- Plans showing drop locations and cable IDs, Telecom Rooms, details (e.g., outlet detail), splice locations.
   4. T3- Telecom Room plans and details. Plan of racks, ladder racks, ground blocks, 110 blocks, other devices. Backboard elevations, etc. Provide rack elevations showing patch panels, wire management, power strips/PDU, power outlets, other devices used. Fabrication drawings for custom-built equipment. Show typical wiring schematics including the following: Patch panels, Fiber-optic termination shelves. Interface requirements, including connector types and pin-outs, to external systems and systems or components not supplied by the contractor.
   5. T4- Typical detail drawings- faceplate labeling, faceplate types, firestopping, ADA, etc.
   6. T5- Schedules- Provide spreadsheets in Microsoft Excel format to show information for cut overs and cable management. System labeling schedules, including electronic copy of labeling schedules, as specified. Software and format selected by Owner.

C. Testing Report

D. All documentation required per TIA 606 B (latest)

E. Product Certificates: For each type of cable, connector, and terminal equipment, signed by product manufacturer.

F. As-Built Record Documentation.

G. Manufacturer Seismic Qualification Certification

H. Operation and Maintenance Data: For voice and data communication cabling to include in emergency, operation, and maintenance manuals.

I. Qualification Data: For Installer and testing agency. Certificates
   1. Contractor Certification: Installing Contractor must have C-7 California Contractor License. Submit evidence that the Contractor is certified by the manufacturers of the proposed communications cables. If different manufacturers will be used, provide certification for all manufacturers. Provide evidence of a minimum of 5 years of cabling installation type work.
   2. Foreman and Installer Certification: Submit evidence that the foreman overseeing the job and all cable installers working on the installation of the communications cabling are certified to install these cables by all of the manufacturers of the communications cables used.

1.05 COORDINATION

A. Coordinate layout and installation of voice and data communication cabling with Owner's telecommunications and LAN equipment suppliers. Coordinate service entrance arrangement with local exchange carrier.
   1. Meet jointly with telecommunications and LAN equipment suppliers, local exchange carrier representatives, and Owner to exchange information and agree on details of equipment arrangements and installation interfaces.
   2. Record agreements reached in meetings and distribute to other participants.
   3. Adjust arrangements and locations of distribution frames and cross-connect and patch panels in equipment rooms and wiring closets to accommodate and optimize arrangement and space requirements of telephone switch and LAN equipment.

1.06 SCOPE OF WORK

A. The work shall consist of the furnishing, installation, termination, testing and documentation of a complete and fully functional structured telephone and data cabling system. The work shall be compliant with the above listed ANSI/TIA/EIA standards.
   1. Provide the telephone and data system termination frames, racks, cabinets and patch panels.
   2. Provide the telephone, data system distribution cables.
   3. Provide the telephone backbone cables, riser and tie.
   4. Provide the data backbone cables.
   5. Provide protective devices for cabling entering the building.
   6. Provide the telephone, data system faceplates and connectors.
   7. Provide color coded data system patch cords.
   8. Provide cross-connect wire and cross-connect backbone cables to distribution cable at the various cross-connect frames
   9. Provide the Telecommunication Room Hardware
      a. Racks and accessories, wire management, PDUs, power strips
      b. Ladder rack,
      c. Patch panels and patch cords
      d. Cross connection blocks
      e. Backboard
      f. Ground bus
   10. Provide J-Hooks and support system
   11. Provide sleeves
   12. Provide the, testing of the communication cabling system
   13. Provide labeling:
      a. All station cabling, jacks, patch cords and connecting cables.
      b. All cabinets, equipment housing, wire-management and mounting brackets.
      c. All distribution frames, wall frames, ladder rack, wire management and mounting brackets.
      d. All splicing and splice protection material.
      e. All fire-stop materials.
      f. All cross connect jumper wires.
   14. Provide all cable mounting materials.
   15. Provide all tie wraps, bushings, and miscellaneous parts and materials.
   16. Provide all grounding materials (except ground connection points) including grounding wires and connectors for distributing ground to all mounting racks, data cabinets, ladder racks, protector modules, cable sheaths.
   17. Provide all earthquake bracing materials, brackets and mounting hardware.
   18. Provide cabling and testing for wireless system, and wireless device installation.
   19. Testing
   20. Coordinate with Owner.
   21. Coordinate with Utility Company. Provide Utility Company requirements.

22. Provide all necessary patch cords.

B. The work shall not include the following:
   1. Supply of telephone handsets and switching equipment.
   2. Supply of telephone and data services.
   3. Supply of active computer and networking equipment.
   4. Supply of computer and network software.

C. No splicing or use on couplers to extend cable lengths. There shall be no couplings/couplers/splices used to extend the length of a cable so that it reaches a designated area. If cable is not of sufficient length a new cable shall be ran. Keystones used should match the type of ethernet cable being used. A Cat6 Keystone must be used with Cat6 ethernet cabling. A Cat6a Keystone must be used with a Cat6a cabling.

1.07 STANDARD TELEDATA OUTLET-

A. Provide a 120 VAC duplex receptacle per requirements in Section 3.10.

B. Verify Standard Outlet with Owner's Representative.

C. Wall outlet - Provide 4-11/16" square, 2-1/8" deep flush wall box at +18" AFF with 1 device ring and faceplate, (1) color coded data RJ 45 connector (T568B wiring) and CAT cable and (1) color coded RJ 45 connector and CAT cable. Attach device boxes with adjustable bar type hangers screw fastened to two stud/ceiling joists on both sides of box. Provide 1" EMT conduit stub-up with pull rope and bushings extended 3" above top plate if accessible or extend to accessible ceiling. Provide labeling per TIA 606 and/or Owner (See labeling section)

1.08 STANDARD FLOOR BOXES/POKE THROUGHS

A. Per plans and details.

1.09 COLOR CODING:

A. All communication cabling, outlet connectors, patch panels and 110 punch blocks shall be color coded per the Owner. Verify colors with the Owner's Representative prior to purchase. The following is the color standard for all horizontal cabling:

	Data / VoIP	Audio / Visual	Camera	Wireless	Building Automated System	Lighting Controls
Cable Type	Cat 6	Cat 6	Cat 6a	Cat 6	Cat 6	Cat 5e
Cable Color	White	White	Green	Green	Orange	Yellow
Keystone (Jack)	Left – yellow Right - blue	Purple	Red	White	Orange	N/A

1.10 SYSTEM DESCRIPTION AND REQUIREMENTS

A. DATA CENTER (MDF) - MPOE (Minimum Point of Entry) or service provider's point of connection is located in the MDF room. The new data system will be connected to the City's fiber system. New fiber from MPOE – MDF to IDF's in a star configuration. The owner will provide all server equipment, telephones, pcs, and software. Coordination of the required underground site conduit for this purpose is required scope of work for this project.

   1. Utility Coordination - This room is the MPOE for the Telecom Utility Service. Coordinate with the Utilities and provide the required provisions for the Utilities services Data, Telephone, and TV.
   2. Furnish, install, and test the materials and equipment as described in the specifications and on the plans per the Division of Responsibilities section above.

PART 2 PRODUCTS

2.01 EQUIPMENT RACKS

A. Freestanding and wall-mounting, racks with bracing and anchor kits. modular steel units designed for telecommunications terminal support and coordinated with dimensions of units to be supported.

B. Rack Accessories
   1. PDU - metered, switched, 2U, amperage, voltage, phases, and outlet types to suit equipment, CPI or equal. Two per rack.
   2. Power strips- Dimensions, voltage, amperage, outlet type as required for equipment. CPI or equal
   3. Horizontal and vertical cable mangers as necessary- CPI or equal
   4. Stand off bracket- CPI or equal
   5. Cable Strain Relief Bracket- CPI or equal
   6. Fiber management- Horizontal Furcation Bracket, Fiber Module Adapter, Fiber Trunk Cable Manager, other as needed CPI or equal
   7. Specific rack application per plans.

C. Manufacturer: Chatsworth (CPI) or equal

2.02 LADDER RACK

A. A. Provide seismic Chatsworth 10250 series horizontal and vertical ladder racks, accessories and supports (11312 series).
   1. Cable ladder rack shall be black in color.
   2. The racks shall be twelve, eighteen inches or twenty-four inches wide minimum and must be sized for three times the initial installation.
   3. The ladder rack shall be equipped with a four-to-six inch fence on both sides to support bundles of patch or jumper cables. This fence shall mechanically attach to the side or bottom of the ladder, not the surface over which the cable will be placed.
   4. The racks shall be classified by Underwriters Laboratories (UL) as suitable for equipment grounding.
   5. The Contractor shall provide manufacturer’s standard clamps, hangers, brackets, splice plates, reducer plates, blind ends, barrier strips, connectors, and grounding straps. Provide wire management between racks and patch panels and their suitable locations.

B. Manufacturers: Chatsworth or equal

2.03 INTERBUILDING OUTSIDE PLANT (OSP) BACKBONE FIBER OPTIC CABLE

A. Provide armored outside plant fiber optic backbone cabling between Buildings. Provide, install, test, and document the fiber Optic cable per ANSI/TIA/EIA-568-C.

1. Multimode 50/125 micrometers (OM4, 850 nm Laser Optimized) X=F in part #

2. Single mode- See Audio Visual specifications

3. Manufacturer: Superior Essex " Dri-Lite loose Tube Double Jacket Single Armor",

PN: varies: 1A024FD01 thru 1A288FD01 (for items 1, above) or equal. 24 strand

fiber count minimum.

2.04 INTRABUILDING BACKBONE FIBER OPTIC CABLING

A. Provide armored indoor-outdoor (OFCP) fiber optic backbone cabling within Buildings. Provide, install, test, and document the fiber Optic cable per ANSI/TIA/EIA-568-C.

1. Multimode 50/125 micrometers (OM4, 850 nm Laser Optimized)

2. Single mode- See Audio Visual specifications

3. Manufacturer: Superior Essex "Interlocked Armored", PN: varies: L30242KW001 or equal. 24 strand fiber count minimum.

2.05 HORIZONTAL CABLING (COPPER)

A. Application: To Work Area Outlets, 4 pair

B. All cabling shall be compliant with the latest ANSI/TIA/EIA 568 standard

C. All cabling shall be plenum CMP.

D. All cabling shall be color coded..

E. All cabling (except fiber) shall be rated for power over Ethernet PoE

F. Manufacturer: Superior Essex or equal.
   1. Voice/Data
      a. Cat 6- Superior Essex, PN 77-272-xA (CMR); 77-272-xB (CMP) or equal

G. There shall be no couplings/couplers/splices used in order to extend the length of a cable so that it reaches a designated area. If the cable is not of sufficient length, then a new cable shall be ran.

2.06 CABLE AND PATHWAY TAGS AND LABELS

A. Materials: Metal or heavy plastic identification tags with cable type and number, copper pair or optic number assignments, and destination shall be provided on both ends of all cables (except station cables) and all splice cases. All cables shall be clearly labeled with cable number (campus to provide numbering scheme) and size at each end of the cable, when it enters or leaves a conduit and at 30-foot intervals when run in accessible areas such as tunnels, manholes, ceilings, etc.

B. Manufacturer: Panduit or equivalent

2.07 VOICE/DATA WORK AREA OUTLETS (COPPER ONLY)

A. Locations shall be single-gang mounting plate with ports per plans containing the following devices.
   1. Faceplate, 2 port, - Netkey Panduit NK2FIW Compatible with jack. Snap in.
   2. RJ-45 Jacks keystone colored per above section- PANDUIT NK688MIW-
   3. Blank Outlet - for future or expansion outlets.

B. Manufacturer: Panduit or equal

C. Device locations are subject to change depending on the location and furniture configuration and/or setup.

2.08 FLOOR BOXES (SEE DRAWING DETAILS)

A. Provide Wiremold EFB8S Floor box for(raised wood floor applications
   1. Cover black-EFB610BTBK
   2. Faceplate, 6 port, white - Netkey Panduit NK6FIW Compatible with jack. Snap in.
   3. RJ-45 Jacks keystone colored per above section- PANDUIT NK688MIW-
   4. Emergency 120 Vac duplex receptacles- (2) color red
   5. UPS 120Vac duplex receptacles- (2) color orange

B. Provide On Grade rated floor boxes for grade level applications (damp) (e.g., Wiremold Legrand EFB8SOG)
   1. Cover black-EFB610BTBK
   2. Faceplate, 6 port, white - Netkey Panduit NK6FIW Compatible with jack. Snap in.
   3. RJ-45 Jacks keystone colored per above section- PANDUIT NK688MIW.
   4. Emergency 120 Vac duplex receptacles- (4) color red.

2.09 DATA PATCH PANELS (MODULAR TYPE) (COPPER)

A. Provide 48 Port modular patch panels (Category 6, Poe+) and 48 Port modular patch panels (Category 6a, Poe+) which meet the following specifications:
   1. ANSI/TIA-568-C.2 (or latest) compliant min., modular type, PoE+ rated RJ-45 keystone connectors snap in panel.
   2. Rack mountable in an EIA standard 19" rack.
   3. RJ-45 Jacks keystone colored per above section- Panduit NK688MIW. Color code patch panel by populating patch panel with RJ-45 connector of the same color per color code section 1.09. In general, racks will be assigned for each by color code.
   4. Terminate all data cables with T568B pin sequence.
   5. Terminates 22 through 24 AWG wire.
   6. Complies with UL 1863 standard.
   7. Meets EIA/TIA 568-C (or latest) standards for connecting hardware..
   8. Accessories quantity as needed- cable managers, labels and patch cords, etc.
   9. Provide 25% spare capacity.

B. Manufacturer: Panduit
   1. Panduit flat DP6a series (cat 6a), NK6PPG series (cat 6), or equal. Match selected cable system category min. (e.g., 6, 6a) per Part 1.

2.10 COMMUNICATIONS BACK BOARDS

A. 3/4" fire resistant plywood backboard from the floor level to 8'-0" A.F.F. Paint matte white with fire retardant paint. Do not paint over fire label. Cutout over existing devices to allow access. Attach to existing studs with #10 x 2" sheet metal screws (or #10 wood screws as applicable) at 24" on center maximum horizontal and 16" maximum vertical and within 2" of top and bottom. Ensure that a minimum of (1) Mill stamp is exposed from paint on each backboard panel. Provide a copy of the Mill certificate in the O&M manuals.

2.11 GROUNDING AND BONDING

A. TMGB- Copper having minimum of 95% conductivity, 0.25" thick x 4" wide. Insulated from mounting support. UL listed. With holes for connecting telecommunications bonding backbones (TBB) UL listed compression two hole lugs.
   1. Manufacturer: Panduit PN: GB4B series or equal.

B. TGB- Copper having minimum of 95% conductivity, 0.25" thick x 2" wide. Insulated from mounting support. UL listed. With holes for connecting telecommunications bonding backbones (TBB) UL listed compression two hole lugs. Panduit PN: GB2B series or equal.
   1. Manufacturer: Panduit PN: GB2B series or equal.

2.12 PULL BOXES AND CABINETS

A. Materials: All pull boxes and cabinets shall be galvanized steel. No extension boxes will be accepted. Cabinets mounted on an outside wall of a building shall be equipped with a 5/8" inch plywood backboard, gaskets or equipment required to maintain a weatherproof enclosure, and a door latch that can be locked (matching keys).

2.13 PROTECTORS

A. Provide UL 497 listed primary protection devices for telecommunication lines entering a building per CEC 800.

B. Manufacturer
   1. Erico- Voice applications only- Models HSP or SLP10K1F (10 pair, provide rack or din rail mounting)
   2. Emerson- Voice 100 pair, UL 497

2.14 FIRESTOP

A. Provide wall, floor, ceiling penetrations per CBC chapter 7. For rated walls provide a UL tested and classified fire stop system with flame (F) ratings no less than the fire rating of penetrated

wall structure. For rated floors and ceilings provide a UL tested and classified fire stop system with flame (F) and temperature (T) ratings no less than the fire rating of penetrated wall structure. T rating can be 0 if conduit stubs up into a wall per the CBC.

B. Manufacturer: Specified Technologies Inc,
   1. Specified Technologies Inc, EZ-path (4” x 4-5/8” x 14” long) or equal,
   2. Conduit sleeve (e.g., 4" EMT) with bushings on each side and a UL firestop system for fire rated structures as applicable.

2.15 FLOOR BOXES AND POKE THRU

A. Provide On Grade rated floor boxes for grade level applications (damp) (e.g., Legrand EFB10FOG).

B. In existing buildings above grade applications use fire rated UL listed poke thru devices matching the fire ratings of floor (e.g., Legrand 8AT)

C. For new construction, fire rated floor boxes (Legrand EFB8S) or poke thru devices (e.g., Legrand 8AT) may be used.

D. Provide power and teledata outlets and accessories

E. Manufacturer: Legrand or equal

2.16 J-HOOKS

A. J-hooks and support hardware: Provide support hardware to suit application.

B. Manufacturer:
   1. Erico/Caddy
   2. Stiffy
   3. or equal

2.17 TIE WRAPS

A. Plenum rated, UL listed for plenums, Velco Tie Wraps

B. Manufacturer: Leviton or equal

2.18 POWER DISTRIBUTION UNIT (PDU)

A. Provide Tripp-Lite PDU Model PDUMH30 to match outlets, 19" Rack mountable 1U. Provide (2) minimum per rack and as necessary.

B. Manufacturer: Tripp-Lite

PART 3 EXECUTION

3.01 GENERAL

A. Install, document and test per applicable TIA standards

B. Perform all installation work in a neat, high quality manner using qualified craftspeople.

C. General: Coordinate the features of materials and equipment so they form an integrated system. Match components and interconnections for optimum future performance.

D. Expansion Capability: Unless otherwise indicated, provide spare fibers and conductor pairs in cables, positions in cross-connect and patch panels, and terminal strips to accommodate 20 percent future increase in active workstations.

E. Place cables with sufficient bending radius so as not to king, shear, or damage jackets, binder or cables, including where cables are coiled for future use or slack. Do not exceed manufacturers' specified bending radii. Do no wrap cables around the feet of systems furniture.

F. Do not pull tie wraps so tight as to kink or crimp the cable jackets.

G. In no event shall any station cables be spliced (between closets and workstation locations).

H. Ceiling tiles broken or defaced by the Contractor during the installation and testing process shall be replaced at the cost to the Contractor.

I. Ensure that all floor and wall penetrations will be firestop rated to the satisfaction of the Owner and as required by applicable codes. Provide firestop, after cables have been installed, tested and documented.

J. Provide engineering quantities of and installing any necessary J-hooks for routing cables in ceiling plenum space. Place J-hooks at a minimum of every five feet (5 feet) along cable routes. They should also be placed at every drop point such as conduit stub-up, without exception, and wherever support is needed to avoid sagging or to avoid touching piping, ducting or other work. Attaching or draping cables to ceiling wire grid, other pipes, light fixtures, etc. will not be permitted. Rather, contractor must provide separate ceiling wire for securing J-hooks. Use of the ceiling wire grid installed by others is not permitted.

K. Individually and properly ground all relay racks, ladder rack, equipment cabinets and inside and outside plant cable shields, wherever the cables leave the sheaths, to Owner-supplied building grounds.

L. Individually and properly ground, all voice punch-down cable frames and other Contractor-supplied hardware in the Main Distribution frame as required to the Owner-supplied signal ground points.

M. Do not daisy-chain equipment grounding.

N. Conform grounding to TIA/EIA 607 and NEC Articles 250 and 800. NEC Article 800-40 requires minimum #6 AWG, or better, wire be used for grounding to main building ground.

O. Perform daily clean-up following all installations and terminations.

P. Provide a project manager who has demonstrated the ability to supervise a project of this magnitude. The project manager must be available to be interviewed by the Owner and/or their representative. Acceptance will not be unreasonably withheld.

3.02 TELECOMMUNICATIONS SERVICE ENTRANCE TO BUILDING(S).

A. Coordinate with the Utility Company(s). Provide the required service entrance per the Utility's requirements: conduits, trenching, backfill, cabling, pull boxes, backboard, etc.

3.03 RESTORATION OF EXISTING IMPROVEMENTS.

A. Selective site demolition to provide all new utilities and utility connections, including all existing improvement removal, and all improvement restoration work.

B. Utility paths are shown diagrammatically on Plans, and it is the Contractor’s responsibility to determine the actual routes.

3.04 PATHWAYS

A. Horizontal cabling shall be distributed in the ceiling space using open J-hooks, conduit, ladder racks, cable tray and fire penetration sleeves to the outlets shown on the Drawings. Horizontal cabling shall be plenum-rated unshielded twisted pair (UTP) cable connected to voice and data outlets. Where the routing path must cross inaccessible ceilings, provide conduit to accommodate the equivalent number of cables (40% fill max).

1. J-hooks - Attach j-hook supports securely to wood/metal studs or structural wood/metal deck above (slip rods are not permitted).Space j-hook supports 4 feet-0 inches on center if attached to walls. Space j-hook supports 4 feet-0 inches on center if hung from structural deck above. Provide a minimum clearance around j-hook cable path with a minimum radius of 18 inches. Provide supports at 5 feet-0 inches maximum intervals from the point it leaves the main cable runs to the conduit stub. Provide individual cable supports as manufactured by Erico cablecat 12 wide base cable supports or equal. Install all necessary J-hooks for routing cables in ceiling plenum space. Also place J-hooks at all drop points such as conduit stub-ups, and wherever support is needed to avoid sagging or to avoid touching lighting fixtures, piping, ducting work. No attaching or draping cables to ceiling wire grid, other pipes, light fixtures, duct work and other equipment will be permitted.

B. Riser cabling shall be in conduit or shaft per CEC 800 and used for vertical floor to floor applications.

3.05 FIRESTOP

A. Provide wall, floor, ceiling penetrations per CBC chapter 7. For rated walls provide a UL tested and classified fire stop system with flame (F) ratings no less than the fire rating of penetrated wall structure. For rated floors and ceilings provide a UL tested and classified fire stop system with flame (F) and temperature (T) ratings no less than the fire rating of penetrated wall structure. T rating can be 0 if conduit stubs up into a wall per the CBC.

3.06 LADDER RACK (CABLE RUNWAY) -

A. Provide horizontal and vertical ladder racks in the telecom spaces (TR, IDF, MDF) to distribute cabling. Arrange the ladder rack to collect cables entering the space (sleeves) and to distribute cables between racks and equipment. Provide vertical ladder rack to distribute cabling from floor sleeves or wall mounted 110 blocks to racks or other equipment. The width of the ladder rack shall be determined based on the max. number of cables allowed per the manufacturer's instructions. Provide a 12" wide ladder rack at minimum.
   1. See Telecommunication room plans to determine amount of runway stringers required. Runway system shall be around the edge of the Telecommunication Rooms from the edge of the room over the equipment racks for the routing of cable as shown on the enlarged floor plan. Provide all incidental items required to install the cable runway system. Provide all necessary components to ground the cable runway system to the telecommunication grounding system. Provide wall-mounted supports for ladder runway when runway runs along walls. Provide threaded rod support for runway. Install per manufacturer's instructions..
   2. Bond and ground the ladder racks per TIA 607

3.07 BACKBOARDS:

A. 3/4" fire resistant plywood backboard from the floor level to 8'-0" A.F.F. Paint matte white. Do not paint over fire label. Cutout over existing devices to allow access. Attach to existing studs with #10 x 2" sheet metal screws (or #10 wood screws as applicable) at 24" on center maximum horizontal and 16" maximum vertical and within 2" of top and bottom. Ensure that a minimum of (1) Mill stamp is exposed from paint on each backboard panel. Provide a copy of the Mill certificate in the O&M manuals.

3.08 PATHWAYS

A. Underground Conduit Systems:
   1. In Trench- Provide excavation, clearances from other utilities, encasing, trenching, boring, backfill, compaction, patching, per Division 31 Site Preparation. Provide conduits and boxes (handholes) per drawings and Section 26 05 34.
   2. Provide orange Inner Duct for fiber optic cable installations
   3. Minimum Coverage- Per CEC Table 300.5
   4. Area of Influence- Do not install conduits adjacent and parallel to building footings in the area of influence. See structural drawings and specifications for the area of influence and the methods that conduits can cross a footing.
   5. Drain Slope- Underground conduit shall be installed such that a.125" per foot min. slope exists at all points of the run to allow drainage and prevent the accumulation of water. Provide a drain slope of greater than.125" per foot when extending conduit away from a building.
   6. Duct bank- Per the drawings. See Div 31.

B. Conduit Bends:
   1. Provide no more than (2) 90-degree conduit bends or the equivalent number of smaller radius bends in any conduit run between boxes or equipment.
   2. Length of run: 400-feet maximum less 100-feet for each equivalent 90 degree bend.

3. Fabricate bends and offsets with a hickey or conduit bender designed specifically for use with the type of conduit to be bent, or use factory made bend.
4. Radius of Bends: Conduits inside bend radius shall be at least 10 times the conduit diameter.

3.09 CABLING

A. All cabling not in conduit shall be plenum CMP.

B. All cabling shall be compliant with the latest ANSI/TIA/EIA 568 standard

C. All cabling shall be color coded. See part 1.09.

D. All cabling (except fiber) shall be rated for power over Ethernet PoE.

E. Splices are not permitted for horizontal cabling.

F. Maximum lengths:
1. Total copper cabling- 295 feet.
2. Combined work area cords, patch cords, and equipment cords - Max length is 33 feet for copper (Cat) cords
3. Fiber optic cable max supportable length varies depending on media and base. Max supportable lengths shall be per EIA/TIA 568 latest (e.g. TIA 568 C.0, Table 7)

G. Minimum Bend Radius
1. Copper: Per TIA 568-C.0 (latest), 4x diameter (no load)
2. Fiber: Per Table 2 TIA 568-C.0 (latest) typically 10x diameter

H. Conduit fill shall be not greater than 40%. The following are examples:
1. 1" EMT: 7 Cat 6 cables maximum (Cat 6, 4pr, CMP,.236" OD)
2. 1" EMT: 4 Cat 6a cables maximum (Cat 6a, 4pr, CMP,.300" OD)

3.10 STANDARD TELEDATA OUTLET-

A. There shall be a 120 VAC duplex receptacle minimum within 3 feet of every multiport telecom outlet at the same elevation for workstation equipment served by teledata outlet.

B. Wall outlet - Provide 4-11/16" square, 2-1/8" deep flush wall box at +18" AFF with 1 device ring and faceplate, (2) color coded data RJ 45 connector (T568A wiring) and CAT cable and (2) color coded voice RJ 45 connector and CAT cable. Attach device boxes with adjustable bar type hangers screw fastened to two stud/ceiling joists on both sides of box. Provide 1" EMT conduit stub-up with pull rope and bushings extended 3" above top plate if accessible or extend to accessible ceiling. Provide labeling per TIA 606 and/or Owner (See labeling section)

3.11 GROUNDING AND BONDING THE TELECOMMUNICATIONS DISTRIBUTION SYSTEM.

A. Provide grounding and bonding per ANSI/TIA-607-B and the CEC. Each telecom room, including all racks, trays, ladder racks, telecom equipment, conduits, pathways etc. shall be bonded together and connected to the Telecommunication Ground Busbar (TGB). The TGB shall be grounded to panelboards in the room, and building steel (if applicable), and bonded to the Telecommunications Main Ground Busbar (TMGB) located at the Telecommunications Entrance Facility. The TMGB shall be grounded at the Service Entrance Ground (Main Switchboard), local panelboard(s) and building steel. A Telecommunications Bonding Backbone (TBB) and Grounding Equalizer ties all telecommunications rooms together in a continuous equipotential ground loop. Sleeves and J-hooks do not require grounding. See TIA 607-B Figures 2 and 3.

B. The minimum inside bend radii of all grounding cables shall be eight times their diameter, if unshielded, and twelve times their diameter, if shielded. All bonds at the equipment racks shall use silver epoxy and ground lugs.

C. Telecommunications Entrance Facility/ Minimum Point of Entry (MPOE)/MDF
1. Provide a single Telecommunications Main Grounding Busbar (TMGB)

2. TMGB- Copper having minimum of 95% conductivity,.25" thick x 4" wide x length as needed. Insulated from mounting support. UL listed. With holes for connecting telecommunications bonding backbones (TBB) UL listed compression two hole lugs.
3. Locate the TMGB near a panelboard in the MDF if applicable. Bond the TMGB to the Electrical Service Equipment ground busbar (Main Switchboard MSB) with the Bonding Conductor for Telecommunications (BCT), the local panelboard(s) and building steel. Minimize the length of the bonding conductor to the MSB. Also, minimize the length of the telecom service provider's required primary protection grounding conductor for new service applications (coordinate with utility). Connect all MDF racks, trays, ladder racks, telecom equipment, pathways, etc. bonding conductors to the TMGB. Connect the TBB to the TMGB.
4. Telecommunications Backbone Backbone (TBB)- The size of the TBB shall be a minimum of #6 AWG colored green. The TBB shall be sized at 2 kcmil per linear foot of conductor up to a maximum of 750 kcmil. See TIA 607-B table 1. Color green.
5. Bonding Conductor for Telecommunications (BCT)- size the same as the largest TBB. Color green.

D. Telecom Rooms/ Intermediate Distribution Frame Room (IDF)
1. Provide a Telecommunications Grounding Busbar (TGB)
2. Locate the TGB near a panelboard in the MDF if applicable. Bond the TGB to the local panelboard(s), and building steel with #6 green wire. Connect all racks, metal enclosures, trays, ladder racks, telecom equipment, conduits, pathways etc. to the TGB using #6 green wire.
3. Provide labeling of bonding/grounding conductors per the TIA 606.

3.12 SPLICE CASES

A. All splice cases must be encapsulated and mounted to the interior wall of the pull box or vault. The cable sheath and splice case must be bonded and grounded to the building ground upon entry to the building. In the MPOE, the outside plant cable must be terminated on circuit protection blocks fitted with solid state fuses. The circuit protection blocks must be grounded to the building ground system. Testing must verify continuity, pair mapping, shorts and opens. Test results must be available in hard copy and soft,

B. Provide splice case for cable transitions from outside plant rated cable to indoor plenum rated cable.

3.13 WIRE MANAGEMENT

A. Vertical Wire Managers
1. Equipment vertical wire managers shall be ten inches wide and shall have a minimum of seven evenly spaced wire rings designed to maintain jumper, patch, or cross-connect wire in place. Four (4) cable management spools (minimum 3” in diameter) shall be placed evenly starting from 24” A.F.F.
2. These organizers shall be designed to extend past the frame to allow placement of equipment in any position within the rack. When mounted between equipment frames, they shall be designed to direct cables into either frame and shall be securely mounted to both units.
3. The horizontal wire managers shall be a minimum of six inches wide and shall have a lip or fence no less than six inches deep. In any location designed to support over 150 stations, the minimum size shall be nine inches wide.

B. Horizontal (Mounted in The Frame Between Equipment) Wire Managers
1. In-frame horizontal managers shall range from one to two rack units in size and hall extend from side rail to side rail. These units shall be equipped with a minimum of four horizontal supporting rings and a minimum of eight smaller retaining rings top and bottom to route cables directly into equipment ports. The horizontal retaining rings shall be a minimum of 3” by 3”.

2. Frames shall be equipped with one appropriately sized wire managed for each piece of cable terminating equipment.

3.14 INSTALLATION

A. Horizontal Distribution Cables:
   1. Install four-pair voice and data UTP station cables to all outlets as shown on the approved shop drawings, with jacks placed in faceplates.
   2. The cable for a typical flush mounted closed wall outlet extends from the outlet, up inside the wall conduit to the ceiling space, then run to the IDF or the MDF for voice/data, and terminated on patch panels.
   3. Typical systems furniture will be run in the space provided by the manufacturer then up into the ceiling space before heading to the nearest IDF or to the MDF if the cluster is against a wall.
   4. When installing cables in conduits with pull-strings, replace used pull-strings with new ones.

B. Tele/Data Cabinets:
   1. Data UTP station cables are to be run to Cat patch panels, mounted in racks, allowing for any-to-any configuration.
   2. Voice station cables are to be terminated on-patch panels.
   3. Bolt each rack to the next one and earthquake brace each rack to the concrete floor below.

3.15 LABELING:

A. Provide labeling per TIA 606 or Owner. Class 1 and 2 administration includes Telecom Room identifier; cabinet, rack, wall segment (e.g 110 blocks); patch panel and termination block identifiers, port and term block positions, cable identifiers, firestop identifiers, ground block identifiers. Class 3 administrations include campus building and interbuilding cabling identifiers Furnish and install small white labels for labeling all patch panel ports, medium white labels for labeling all patch panels, and large white labels (1.52 inches wide x 2.54 inches long) for labeling all 110 block covers. Prior to installation of the telecommunications cabling submit shop drawings showing the proposed labeling scheme The following are examples of required labeling per TIA 606:
   1. Work Area Outlet (WAO)-
      a. Faceplate heading shall be labeled with “nn-nnna/b/c/d”
         nn: floor (unless there are multiple IDFs per floor)
         nnn: drop location sequentially numbered per floor
         a/b/c/e: identifies the network cable within each drop location

         For example, 03-001a labeled in the IDF/MDF would indicate 3rd floor of the building, drop location 1 wire a.
      b. Each faceplate connector shall be labeled the same as the faceplate heading.
   2. Cable
      a. Cable connecting WAO to patch panel label- Per TIA 606B label within 12" from each end of the cable which is visible on the exposed part of the jacket.
   3. MDF/IDF Modular Patch Panel labeling shall match WAO labeling.

3.16 TESTING

A. Provide "fall of potential" ground testing for grounding electrode system by qualified contractor (NETA Certified) per Motorola Standard R56 and ANSI STD 81. The criteria is 5 ohms max. Also provide 2 point testing per TIA 607-B with 100 milliohms max between grounding electrode system and test points. Prepare, submit and conduct acceptance test testing per Section 26 08 01 "Acceptance Testing" and 26 01 00 "General Requirements of Electrical Work" and 26 05 26 "Grounding and Bonding".

B. Test all connecting hardware, copper cabling and cords, cross connections, outlets and terminations to demonstrate that all cables meet or exceed all TIA/EIA 568-C (latest) performance specifications. Tests must demonstrate full compliance with applicable Category specifications. Provide testing and documentation per the following TIA/EIA 568-C (latest) Normative Annexes:
   1. Reliability testing of connecting hardware
   2. Measurement requirements
   3. Cabling and component test procedures
   4. Connecting hardware transfer impedance test method

C. Provide and submit test results for all conductor pairs of all cables on soft copy media agreed upon by Owner in an MS Excel worksheet format. Provide and submit 3 hard copy sets.

D. Complete testing and labeling, with test results presented to the Owner's Representative no later than 3 weeks prior to move-in. Remove and replace all cables failing to meet above indicated standards, with cables that prove, by testing, to meet the standards.

E. All horizontal cables, outlets and termination shall meet or exceed all performance specifications per TIA/EIA 568C (or latest).

F. Testing and labeling shall be completed, with test results presented to the Owner no later than one week prior to move-in.

G. Testing of the basic link as defined by TIA/EIA 568 (latest), and including the horizontal cable, outlet and patch panel or 110 block, must include end-to-end tests using a Microtest PentaScanner+ with 2-Way Injector+ or Owner-approved equivalent. Tester will be equipped with AC adapter, printer cable, and appropriate report software for turning raw test data into finished reports. Note: Tester to be left with Owner after completion of testing. Contractor will use tester and software to provide test results deliverable on a soft copy media approved by Owner's Representative an approved electronic format as well as in a hard copy format. Information will include, but not limited to the following:
   1. Opens,
   2. Shorts,
   3. Grounds,
   4. Continuity,
   5. Polarity, or pair reversals,
   6. DC resistance,
   7. Impulse noise,
   8. Signal attenuation
   9. Insertion loss
   10. NEXT (near-end crosstalk)
   11. Station cable length/overall loop resistance.

H. Fiber Optic Cable Testing:
   1. Test multimode fiber optic cables per TIA 526-14 (or latest) and single mode per TIA 526-7.
   2. Using an Optical Time Domain Reflectometer (OTDR), test and record, the quality of each cable while still on the reel, prior to installation, to verify that no damage has occurred during shipment. Test in one direction only.
   3. Multimode-Per TIA 526-14 one jumper method, measure the end-to-end attenuation for all installed cables, including: All splices, the terminated fiber itself, all connectors, and patch panel couplings. The total loss shall be measured and reported for each cable at the appropriate operating wavelengths, 850nm, 1300nm for multi-mode, and 1310 and 1550nm for single-mode. Optical attenuation measurements are to be done from both directions, end-to-end. The maximum permissible loss on each multi mode cable is less than 3.5 db/km at 850nm and 1.5db/km at 1300nm. The maximum permissible loss on each single mode cable is less than.5 db/km at 1310 nm and.5db/km at 1550 nm. Losses through each panel connector shall not exceed 0.2dB. Losses through each fusion splice,

if used, shall not exceed 0.2dB. Provide test results showing TIA 568.C3 (latest) acceptance criteria vs the actual results with a pass or fail.

4. Single mode- Per TIA 526-7 method A.1. Provide test results showing TIA 568.C3 (latest) acceptance criteria vs the actual results with a pass or fail.

I. Any cables failing to meet above indicated standards must be removed and replaced, at no cost to the Owner, with cables that prove, in testing, to meet the standards. The installation will not be accepted until testing has reported that all pairs in all cables meet the appropriate standards.

3.17 DOCUMENTATION

A. Provide all documentation required by TIA 606 B (latest). Review this documentation with the Owner's Representative and resolve any questions or issues until the Owner is satisfied.

B. Shop Drawings- See Submittal section

C. Project Documentation: Submit immediately upon completion of testing and labeling of System. They will be used by the Owner for making data and voice equipment connections to the System:
   1. Provide all documentation required by TIA 606 B (latest)
   2. Reproducible As-built drawings of T shop drawings and E drawings
   3. Show interconnection to AV Equipment & Security Equipment.

D. Test results.

E. Manuals of operation and training, as required.

3.18 DEMONSTRATION AND TRAINING

A. Provide at least 4 hours of training and demonstration of the system upon completion,

END OF SECTION

This page intentionally left blank

SECTION 27 41 16
INTEGRATED AUDIO-VIDEO SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Installation of integrated audio-video systems.

1.02 RELATED REQUIREMENTS

A. Division 01: General Requirements

B. Division 06: Finish Carpentry

C. Division 26: Electrical Systems

D. Division 27: Communications Systems

1.03 DEFINITIONS

A. “City”: The owner of the facility.

B. “A/R” (As Required): The quantities on most items are not specified in this specification, so the bidding contractor must refer to the drawings to determine how many items to supply.

C. Scope of Work: This specification section defines certain audio, video, and control systems to be installed the contractor. Please see the “SYSTEM DESCRIPTION” section for specifics.

D. Definition of Terms:

1. The term "shall" is mandatory; the term "will" is informative; the term "should" is advisory; and the term "provide" means furnish and install.
2. The term "custom" indicates systems or components that shall be fabricated by the Contractor based on these specifications and drawings.
3. The term "OFE" refers to Owner-Furnished Equipment, which are specified in other sections, or by some other means or procurement source.
4. The term “OFCI” refers to Owner-Furnished, Contractor-Installed equipment. Coordinate the integration of new components provided by the Owner. Provide required additional mounting hardware, etc. to ensure proper operation of the systems as specified.
5. The term "NIC" refers to work or equipment that is not in contract covered in this section.
6. The term "future" indicates equipment that shall be added to the systems by the Owner or Owner representative at a later date. Provisions shall be made for this equipment.
7. The term "or equal" indicates equal in materials, size, color, design, function, efficiency of specified, and conforming with base bid manufacturer/model.
8. The term "future" indicates equipment that shall be added to the systems by the Owner or Owner representative at a later date. Provisions shall be made for this equipment.
9. The term "or equal" indicates equal in materials, size, color, design, function, efficiency of specified, and conforming with base bid manufacturer/model.
10. Where definitions provided herein differ from those in other Sections, definitions in this Section will take precedence for work in this Section.
11. HDTV: High Definition Television
12. Cabling System: All required equipment and cabling including hardware, cable support, conduit, back boxes, labeling, connectors, splitters, patch cords, modular AV connector

plates, horizontal cabling installed and configured to provide connectivity between equipment locations.

13. Horizontal cabling: All cabling, termination hardware, cable support systems and cable management required to properly place cabling between two points.
14. Channel: Components to include the cable, termination hardware, and patch cables.
15. Provide: To supply all necessary labor and material, including miscellaneous material, accessories and appurtenances required to install, test, and make fully functional and ready for intended use.
16. Install: Same as Provide.
17. Furnish: To supply material only; no installation is required.

E. Section Includes:

1. Supply and install components for audiovisual systems

1.04 INCORPORATED DOCUMENTS

A. Published specifications, standards, tests or recommended methods of trade, industry, or governmental organizations apply to work of this Section where cited by abbreviations noted below.

B. ANSI/TIA/EIA-568-B.1 – Commercial Building Telecommunications Cabling Standards

C. EIA/TIA-569-A – Commercial Building Standard for Telecommunications Pathways and Spaces

D. ANSI/TIA/EIA-607 – Commercial Building Grounding and Bonding for Telecommunications

E. National Electrical Code (NEC)

F. California Electrical Code Amendments (CEC)

G. Underwriters Laboratories (UL)

H. BICSI – Building Industry Consulting Services Intl., Tampa, FL

I. SMPTE – Society of Motion Picture and Television Engineers

J. ISO – International Standards Organization

K. NEMA – The Association of Electrical and Medical Imaging Equipment Manufacturers

1.05 SUBMITTALS

A. Product Data Submittal

1. Submit product information for components specified herein prior to the purchase and installation of equipment. If any equipment or systems are purchased prior to receiving an approved submittal, the contractor incurs the risk if the purchased equipment is not subsequently approved.
2. Submit only one copy of each data sheet to be included, even if the device or system is used in more than one space. At the beginning of the submittal, for each space within the facility, provide an equipment list with the descriptions, manufacturers, part numbers, quantities and page reference for the data sheet of all required.
3. Sequentially mark the page numbers on the data sheets. Arrange the sheets alphabetically by manufacturer. To minimize the size of the submittal, please limit the size of each data sheet to two or three pages.
4. If the data sheet includes more than one part, indicate the manufacturer, model/part number, accessories and options selected, color (if applicable), and a brief product description.

B. Shop Drawing Submittal

When drawings are revised due to authorized changes via RFIs or Change Orders, re-submit these revised drawings.

1. The shop drawing submittal should include a complete package of information required to build the system. If there are questions as to color, accessories to be provided, or coordination issues, these questions should have been asked and answered before the submittal is issued.
2. Provide enlarged AV floor plans and reflected ceiling plans indicating device locations with device legends indicating manufacturer and model number of each device.
3. Provide enlarged AV plans and reflected ceiling plans showing infrastructure requirements in support of the AV system.
4. Provide mounting details for all AV equipment and hardware.
5. Provide functional single-line drawings. Include equipment names and model numbers. Clearly label each item of equipment shown on the drawing with the manufacturer's terminal number or input/output designation (e.g., "Mic 1-In", or "Record Out-Left"). Label the room number of the equipment room on the drawing. Show the entire wire run from source, through the equipment room to the destination, on the same drawing to make it easier to follow signal flow.
6. Provide full-scale drawings of custom wall plates, rack panels and button panels indicating exact lettering, critical dimensions, and finishes. Indicate location and quantity for each plate and panel. Engraving of each plate shall be unique in each space, (i.e. only one M1 in each space).

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver products in factory containers. Store in clean, dry space in original containers.

1.07 RECORD DRAWINGS

A. Provide Record Drawings in accordance with Division 1 requirements. Separately, provide Record Drawings in accordance with this Section, Paragraph 3.07B.

1.08 SYSTEM DESCRIPTION:

This is a WIP description subject to revision.

A. Council Chambers (1-123) and Channel 97 (Equipment) Room (1-128)
1. Provide and install (2) 98” commercial displays on wall tilt mounts
2. Provide and install (2) 65” commercial display on wall tilt mounts
3. Provide and install (12) 8” flush mount 70v ceiling speakers
4. Provide and install ALS IR emitter system for ADA and CBC requirements
5. Provide and install (14) 18” super-cardioid gooseneck mics on dais
6. Provide and install (1) 18” cardioid gooseneck mics at lectern
7. Provide and install (10) dais mounted touch screens with swivel mount to be integrated with OFE voting system (app TBD)
8. Provide and install a multiformat HD-BaseT switcher in the wall cabinet in Channel 97 TV room (1-128)
9. Provide and install a 2 channel 70V amplifier switcher in the wall cabinet in Channel 97 TV room (1-128)
10. Provide and install a control system processor in the wall cabinet in Channel 97 room (1-128)
11. Provide and install a Digital Signal Processor in the equipment rack in 1-128
12. Provide and install a multiformat HD-BaseT switcher in the wall cabinet in Channel 97 TV room (1-128)

13. Provide and install a 2 channel Provide and install a 2 channel 70V amplifier switcher in the wall cabinet in Channel 97 TV room (1-128).

B. Channel 97 Room (1-128)
   1. Provide and install a 4 post, 37 RU equipment cabinet with sides, top and necessary mounting screws and hardware.
   2. Provide and install a Hoffman AN12N12 wall box. All Channel 97 equipment is OFOI.

C. Public Lobby (1-102)
   1. Provide and install wall-mounted (1) commercial grade 65” LCD displays with signage player. Provide and install a stand-alone HDBaseT transmitter at the Owner’s queuing system workstation. Configure the displays for both video and audio.

D. Offices (multiple)
   1. Provide and install (1) commercial grade LCD display with integrated tuner, backbox and wall mounting bracket, and (1) LAN connection. See floor plans for display size.

E. Conference Rooms (multiple)
   1. Provide and install (1) commercial LCD display with wall mounts, backbox, and 4K HDBaseT receiver, see floor plans for display size.
   2. Provide and install (1) 4K HDBaseT transmitter with HDMI in floor box
   3. Provide and install cable surface cable passage system from table to display

F. Small Conference Rooms (multiple)
   1. Provide and install (1) commercial LCD display with wall mounts, backbox, and 4K HDBaseT receiver, see floor plans for display size.
   2. Provide and install (1) 4K HDBaseT transmitter with HDMI on wall plate.

G. Conference Rooms – Large (multiple)
   1. Provide and install large commercial LCD displays with wall mounts, backboxes, and 4K HDBaseT receivers, see floor plans for size and quantity.
   2. Provide and install (4) 8” 70v flush mount ceiling speakers
   3. Provide and install in-room AV cabinet with source equipment (TBD), audio amplifier, source switching, and system control
   4. Provide and install cable surface cable passage system from table to display

H. Training Room (1-308)
   1. Provide and install (1) 85” commercial grade LCD display with wall mounting bracket, backbox, and 4K HDBaseT receiver.
   2. Provide and install 4” 70v flush mount ceiling speakers as shown on ceiling plan
   3. Provide and install in-room AV cabinet (under table) with source equipment (TBD), audio amplifier, source switching, and system control
   4. Provide wireless lavalier mic system

I. Conference Room – Extra Large (1-422)
   1. Provide and install (2) 75” commercial grade LCD displays with wall mounting brackets
   2. Provide 2:1 automatic HDMI switcher
   3. Provide and install 8” 70v flush mount ceiling speakers as shown on ceiling plan
   4. Provide and install 2 channel 70v ampliflier
   5. Provide and install in room AV cabinet
   6. Provide wireless lavalier mic system
   7. Provide and install wall control panel

J. Innovation Lab (1-536)
   1. Provide and install (1) 85” commercial grade LCD displays with wall mounting brackets, backboxes, and 4K HDBaseT receiver.
   2. Provide and install (1) 4K HDBaseT transmitter with HDMI on wall plate.

K. Stockton Stat Room (1-535)

1. Provide and install (1) 86” commercial grade LCD televisions with wall mounting brackets, backboxes, 4K HDBaseT receiver and (1) LAN connection.
2. Provide and install (2) 85” commercial grade LCD television on ceiling deck mounts with 4K HDBaseT receivers and (1) LAN connection.
3. Provide and install (2) HDBaseT transmitters under the table with 8’ HDMI patch cables to the table surface
4. Provide and install (14) 18” super-cardioid gooseneck mics on table
5. Provide and install (1) 18” super-cardioid gooseneck mics on lectern
6. Provide and install a multiformat HD-BaseT switcher in the casework cabinet
7. Provide and install a 2 channel 70V amplifier switcher in the casework cabinet
8. Provide and install a control system processor in the casework cabinet
9. Provide and install a wall-mounted 10” touch panel
10. Provide and install a wall mounted ALS emitter
11. Provide and install 8” 70v flush mount ceiling speakers as shown on ceiling plan

L. Public Lobby (2-101)
1. Provide and install ceiling-mounted (2) commercial grade 40” LCD displays with HDBaseT receivers. Provide and install a stand-alone 1:2 HDBaseT transmitter at the Owner’s queuing system workstation. Configure the displays for both video and audio.

M. Large Conference (2-427)
1. Provide and install (1) 86” commercial grade LCD televisions with wall mounting brackets, backboxes, 4K HDBaseT receiver and (1) and LAN connection.
2. Provide and install (4) HDBaseT transmitters under the table with 8’ HDMI patch cables to the table surface
3. Provide and install (3) ceiling microphones
4. Provide and install a 4:1 HD-BaseT auto-switcher in the undertable equipment cabinet
5. Provide and install a 2 channel 70V amplifier switcher in the undertable equipment cabinet
6. Provide and install a wall-mounted controlpanel
7. Provide and install a digital signal processor in the undertable equipment cabinet
8. Provide and install 4” 70v flush mount ceiling speakers as shown on ceiling plan

N. CATV Distribution
1. Provide and install a RF over CAT 6 cable distribution with the following:
   a. (1) 8 or 16 port distribution hub in an equipment rack in the IDF on each level with CATV locations (see drop number on FP for appropriate port number).
   b. (1) balun at each display location (see drawings for quantity).Run homerun CAT6 cable from each balun back to the IDF with the hub per system drawings.
   c. Pull and connect (1) RG6 riser coax or singlemode fiber between the IDFs with CATV hubs.

O. ADA – Building
1. Provide (only) two portable assistive listening systems for each building meeting ADA and California Building Code (CBC) requirements for accessibility:

PART 2 PRODUCTS

2.01 SEE SCHEDULE A FOR ALL AV EQUIPMENT (SEE SPECIFICATIONS APPENDIX H)

2.02 GENERAL

A. All materials shall be new, installed and turned over free of rust, corrosion or defects. For uniformity, only one manufacturer will be accepted for each type of product.

2.03 WIRING AND CABLE

A. All wiring shall conform to NEC Article 760 and to the manufacturer's wiring specifications.

B. Contractor shall be allowed to use existing conduit pathways.

C. Cables running in plenum air spaces without conduit shall be plenum rated cable. Cables running in areas exposed to environmental factors such as, but not limited to, UV, chemicals, direct burial, etc. shall be rated for such exposure.

D. All cables (except video and sync cables which must be cut to an electrical length) shall be cut to the length dictated by the run. No splices shall be permitted without prior permission of the Consultant. For equipment mounted in drawers or on slides, the interconnecting cables shall be provided with a service loop of appropriate length.

E. No cable shall be installed with a bend radius less than that recommended by the manufacturer.

F. All wiring shall be UL Listed for the intended application.

2.04 CABLING

A. All Cabling shall conform to following codes and standards:
   1. ANSI - TIA/EIA 568B, Commercial Building Telecommunications Cabling Standard
   2. ANSI- TIA/EIA 569A, Commercial Building Standard for Telecommunications Pathways and Spaces
   3. ANSI - TIA/EIA 607, Commercial Building Grounding and Bonding Requirements for Telecommunications
   4. NFPA 70, 2008 Edition - Article 645, National Electrical Code, Information Technology Equipment
   5. NFPA 70, 2008 Edition - Article 800, National Electrical Code, Communications Circuits.
   6. NECA/BICSI 568-2001, Installing Commercial Building Telecommunications Cabling
   7. TDMM- BICSI, Telecommunications Distribution Methods Manual

CABLE TYPES AND ACCEPTED MANUFACTURERS				
TYPE DESCRIPTION	SIZE	PLENUM	MANUFACTURER	PART #
CATV RF CMP	RG6	Y	BELDEN	1152A
CATV RF CMR	RG11	N	BELDEN	1523R
CATV RF CMP	RG11	Y	BELDEN	1153A
Antenna Coax 50 Ohm	RG58	Y	BELDEN	88240
SDI 3G (Rack)	Mini59	N	BELDEN	1855A
SDI 3G	RG59	Y	BELDEN	1506A
SDI 3G	RG6	Y	BELDEN	1695A
SDI 12G	RG7	Y	BELDEN	4794R
CAT5E UTP (Rack)	24GA	N	BELDEN	1583A
CAT5E UTP (Riser)	24GA	Y	BELDEN	1585A
CAT6+ UTP (Rack)	23GA	N	BELDEN	2412
CAT6+ UTP (Riser)	23GA	Y	BELDEN	2413
CAT6+ STP (Media)	23GA	Y	BELDEN	2413F
CAT6A ENHANCED (USB3.0)	23GA	N	BELDEN	10GXS12
CAT6A ENHANCED (USB3.0)	23GA	Y	BELDEN	10GXS13
AUDIO (1-PR SHLD)	22GA	Y	BELDEN	9451P
AUDIO (1-PR SHLD)	22GA	Y	WEST PENN	25291
AUDIO (1-PR SHLD)	20GA	Y	WEST PENN	25292
SPEAKER (1-PR)	12GA	Y	BELDEN	6000UE
SPEAKER (1-PR)	14GA	Y	BELDEN	6100UE
SPEAKER (1-PR)	16GA	Y	BELDEN	6200UE
SPEAKER (1-PR)	16GA	Y	WEST PENN	25225
CONTROL 2-PR (4 COND)	18GA	Y	BELDEN	8875MN
CONTROL 2-PR (4 COND)	22GA	Y	WEST PENN	25510
CONTROL 2-PR (4 COND)	22GA	Y	BELDEN	88723
USBC TO HDMI 4K/60 6'		PATCH	C2G	26889
USBC TO HDMI 4K/60 15'		PATCH	C2G	26890
USB2.0 USBC TO USBA 6'		PATCH	C2G	28871
USB3.0 USBC TO USBA 6'		PATCH	C2G	28832
USB3.0 USBC TO USBB 6'		PATCH	C2G	28866
USB3.0 USBC TO USBA ADP		PATCH	C2G	28868

2.05 LABELS

A. Cable labels: LaserJet or InkJet self-laminating label with white print-on area. Panduit JSL5-V3-1, Brady or equal. No handwritten labels shall be accepted.

2.06 MISCELLANEOUS

A. Insulating bushings. For use with EMT or rigid conduit and designed to protect cable from sharp edges. Arlington Industries or equal.

PART 3 EXECUTION

3.01 GENERAL

A. Work shall be installed in neat, workmanlike manner only by competent and experienced workers. All equipment shall be installed to comply with manufacturer's written instruction.

B. Refer to Drawings for additional installation requirements.

3.02 SCOPE

3.03 WIRING METHOD

A. Install cabling through conduits or sleeves. Use existing conduit paths where available. Provide pull string for future cable installation in any communications conduit 2" I.D. or larger during cable installation.

B. Provide grommets through knockouts prior to placing cable. Provide insulation bushings on conduits and sleeves prior to placement of cable.

C. Penetrations: Seal all rated partition penetrations with a fire stop system acceptable to the Authority Having Jurisdiction. Use specified fire rated wiring device or seal conduits with removable sealant.

D. Provide modular connectors and specified faceplate type at wall locations.

E. Provide 1/4" scale shop drawings of any atypical installation prior to installation.

F. Service cable shall be of sufficient length that all rack mounted equipment should be able to be removed from the front of the rack halfway without disconnecting any cables. On floor and wall boxes, plates should be able to be pulled entirely out of the box and laid on a surface for access to the rear connectors without disconnecting any cables.

3.04 CABLING

A. Provide specified termination hardware and faceplates in accordance with these Specifications and EAV-series Drawings.

B. Provide modular connectors, fittings, and adapters as required to make a fully functional system.

C. Replace any cabling installed under this work that is kinked or chaffed to the point of exposing conductor.

3.05 LABELING

A. Label cables installed as part of this work using the specified labels. Affix labels at each end of cable. Additionally, affix labels to inter-building cables as they pass through pull boxes and underground vaults

B. Provide white labels with black lettering when labeling faceplates and termination hardware.

C. All labeling to be machine generated (Brother P-Touch, Panduit, Brady, ink-jet or laser printer).

D. Add labels to the equipment racks bearing serial numbers of that equipment for which the serial numbers are not readily viewable when mounted.

3.06 TESTING

A. Test equipment: Use testing equipment and methods acceptable to the manufacturer of the connectivity hardware. Include the following procedures.

1. Test all audio, video, RF, wireless and remote-control systems for compliance with the functional requirements and Performance Standards.
2. Configure, provision and align equipment for optimum performance and to meet the manufacturer's published specifications.
3. Prepare and maintain documentation of performance tests, including dates performed, numerical values of established equipment settings, for reference during the System Acceptance Tests. Submit final results prior to scheduling Final Acceptance Tests Manual.
4. Follow Electronic Industries Association Standards RS 219 and RS 160 in performing these tests.

B. Audio Systems
1. Audio Test Signal Paths: Verify signal flow and performance from source inputs (for microphones, recorders, DVD and CD units, etc.) through distribution amps, signal processors, mixers, switchers, etc., to signal destinations.
2. Hum and Noise Level:
   a. Measure the hum and noise levels of the overall system for each microphone input channel and line-level input channel.
   b. Adjust gain controls for optimum signal-to-noise ratio so that full amplifier output will be achieved with 0 dBm at a line-level input.
   c. Terminate line-level inputs with shielded resistors of 150 and 600 ohms, respectively, for these measurements.
   d. Disconnect the loudspeaker lines and terminate the power-amplifier outputs with power resistors for these measurements. The value of the load resistor shall be within 5% of the nominal load impedance of the amplifier under test. The power rating of the resistor shall equal the power rating of the amplifier.
   e. Using the oscilloscope on the output of each audio amplifier with the loudspeakers connected, check to ensure that output is free from spurious oscillation and radio-frequency pickup, in the absence of audio input signal and when the system is driven to full output at 100 Hz. Apply slow sine-wave sweep from 50 Hz to 5 kHz at a level of 6 dB below rated power-amplifier output voltage. Listen carefully for buzzes, rattles and objectionable distortion.

C. Video Systems
1. Video Test Signal Paths: Verify signal flow and performance from source inputs (for cameras, recorders, DVDs, CATV receivers, input plates etc.) through distribution amps, signal processors, switchers, etc., to signal destinations.
2. Signal-to-Noise: Operate system at standard input and output levels. Terminate with standard load impedance. Measure noise level using oscilloscope for signals from 10 kHz to 4.2 MHZ and an RMS volt-meter for signals from 0 to 10 kHz, and calculate signal-to-noise ratio.
3. Test all progressive scan inputs at a variety of common resolutions, up to the native resolution of the display device.

D. Provide one printed copy of test results bound in a 3-ring binder. Organize in ascending outlet ID order. Provide electronic copy of test results for review and approval. Provide software (if other than MS Office) required to properly view and print the test results. If proprietary software is required, provide one copy of user license with the test results.

3.07 DOCUMENTATION

A. Provide all test results on the cabling as specified in Paragraph 3.06.

B. Provide Record Drawings showing device outlet number (label ID). Architect will provide AutoCAD backgrounds for Contractor’s use in developing Record Drawings. Provide electronic copies on CD and two bond copies (1/8” scale). The device outlet number Record Drawings

specified in this paragraph are in addition to Record Drawings, shop drawings, or any other Drawings required by Division 0 and Division 1.

3.08 CLEANUP AND REPAIR

A. Upon completion of the work, remove refuse and rubbish from and about the premises, and shall leave the relevant areas and equipment clean and in an operational state. Repair damage caused to the premises by the installation activities, at no cost to the Owner

3.09 PROTECTION OF WORK

A. During the installation, and up to the date of final acceptance, protect finished and unfinished work against damage and loss. In the event of such damage or loss, replace or repair such work at no cost to the Owner.

END OF SECTION

SECTION 27 53 19

DISTRIBUTED ANTENNA SYSTEM (DAS)

PART 1 – GENERAL

1.00 SCOPE OF WORK

A. Provide a Distributed Antenna System / Emergency Responder Radio Coverage System as described in this specification for this basement of Building 2.

B. Add alternate “E1” Provide a Distributed Antenna System / Emergency Responder Radio Coverage System as described in this specification for Building 1.

C. Add alternate “E2” Provide a Distributed Antenna System / Emergency Responder Radio Coverage System for as described in this specification for Building 2.

D. Provide radio system testing per the 2019 California Fire Code, Section 510.5.3 “Acceptance Test Procedure” to verify that two-way coverage on each floor of the building is not less than 95 percent. The test procedure shall be conducted as follows:

1. Each floor of the building shall be divided into a grid of 20 approximately equal test areas.
2. The test shall be conducted using a calibrated portable radio of the latest brand and model used by the agency talking through the agency’s radio communications system.
3. Failure of more than one test area shall result in failure of the test.
4. In the event that two of the test areas fail the test, in order to be more statistically accurate, the floor shall be permitted to be divided into 40 equal test areas. Failure of not more than two nonadjacent test areas shall not result in failure of the test. If the system fails the 40-area test, the system shall be altered to meet the 95-percent coverage requirements.
5. A test location approximately in the center of each test area shall be selected for the test, with the radio enabled to verify two-way communications to and from the outside of the building through the public agency’s radio communications system. Once the test location has been selected, that location shall represent the entire test area. Failure in the selected test location shall be considered to be a failure of that test area. Additional test locations shall not be permitted.
6. The gain values of all amplifiers shall be measured and the test measurement results shall be kept on file with the building owner so that the measurements can be verified during annual tests. In the event that the measurement results become lost, the building owner shall be required to rerun the acceptance test to re-establish the gain values.
7. As part of the installation a spectrum analyzer or other suitable test equipment shall be utilized to ensure spurious oscillations are not being generated by the subject signal booster. This test shall be conducted at the time of installation and subsequent annual inspections.
8. Systems incorporating Class B signal-booster devices or Class B broadband fiber remote devices shall be tested using two portable radios simultaneously conducting subjective voice quality checks. One portable radio shall be positioned not greater than 10 feet (3048 mm) from the indoor antenna. The second portable radio shall be positioned at a distance that represents the farthest distance from any indoor antenna. With both portable radios simultaneously keyed up on different frequencies within the same band, subjective audio testing shall be conducted and comply with DAQ levels as specified in Sections 510.4.1.1 and 510.4.1.2.

1.01 DESCRIPTION

A. This specification describes the technical and performance criteria for deploying a Neutral-Host Basic Distributed Antenna System (DAS) / Emergency Responder Radio Coverage System (ERRCS) with the ability to support Public Safety Networks (PSN) and **subsequent enhancement** to support Wireless Service Providers (WSP) for Cellular Telephones and/or EWU-Facilities Radio System.

B. Public Safety ERRCS is defined as a two-way wireless radio communications system that is used by first responders and emergency services, such as fire personnel, medical and ambulance services, police, first responders and disaster response units. This system is used exclusively to respond to emergency situations where there is a threat to life and property.

C. The system as specified shall be designed, supplied, install, tested and approved by the local Authority Having Jurisdiction, and turned over to the owner in an operation condition.

D. Submit Distributed Antenna System plans to city for approval in accordance with city guidelines and regulations and reference in the specification.

E. The Distributed Antenna System drawing are to be provided by the contractor and require outside engineering & separate submittals to the building Department for review & permitting. Submit items to the architect for Review & approval prior to city review, per City of Stockton municipal Code chapter 7.28, section 7.2B.310(c).

F. Contractor is responsible for applying for, submitting and paying for design/permits for the Distributed Antenna System.

1.02 RELATED DOCUMENTS

A. American National Standard ANSI/TIA/EIA Telecommunications Building Wiring Standards.

B. Drawings and general provisions of the Contract, including General and Supplemental Conditions and other Division 1 Specification Sections, apply to this Section.

1.03 SECTION INCLUDES

A. This specification describes technical and performance criteria for deploying a Neutral-Host Distributed Antenna System (DAS) to support Wireless Service Providers (WSP) and Public Safety Networks (PSN). The DAS components specified in this document include: Donor Antennas, Coverage Antennas, Coax Cable, Coax Connectors, Splitters, Combiners, Couplers, Fiber-Optic Cable, Fiber-Optic Connectors, and Fiber-Optic Jumpers, Bi-Directional Amplifiers (BDA), Fiber-Optic Master Unit and Fiber-Optic Remote Units.

1.04 SYSTEM DESCRIPTION

A. Services: Upon commissioning, the DAS shall provide coverage for the WSPs and PSNs listed below on all frequencies currently being used by the designated WSPs and PSN in the given market.
   1. AT&T Wireless
   2. Sprint/Nextel
   3. T-Mobile
   4. Verizon
   5. (Example) 800 MHz PSN coverage, City of Grapevine, TX Ordinance No. 109.2

B. The DAS shall have the capabilities to support the following WSP and PSN frequencies deployed in a SISO antenna environment. Any additional Components required for system expansion shall comply with all specifications of this Section.

Service	Uplink, MHz	Downlink, MHz
Cellular	824 - 849	869 - 894
PCS	1850 - 1915	1930 - 1995
AWS	1710 - 1755	2110 - 2155
Commercial 700 Band	698 – 716,776-787	728 - 746
Narrow Band Public Safety 700 Band	799 - 805	769 - 775
800 Band	806 - 824	851 - 869
900 Band	896 - 902	935 - 941
BRS/EBS	2496-2690	

C. WSP Approval: The Contractor shall propose and deploy a DAS system able to receiving WSP Approval for interconnection to the WSPs' macro networks.

D. PSN Approval: The Contractor shall propose and deploy a DAS system that has approval of the PSN Authority Having Jurisdiction (AHJ)

E. Broadband Active Distribution: Single-mode fiber-optic cable will be used for Active distribution. In-line amplifiers are not allowed.

F. Network Management:
   1. NMS: The DAS shall have a Network Management System (NMS) that has alarm, monitor, configuration and control of all Active Components.
   2. SNMP Integration: The DAS NMS shall be able to integrate with 3rd party SNMP based NMS products for alarm purposes and provide alarming information.

1.05 CODES, STANDARDS AND CERTIFICATIONS

A. All work, including but not limited to: cabling, pathways, support structures, wiring, equipment, installation, workmanship, maintenance and testing shall comply with the latest editions of the National Electrical Code, National Electrical Safety Code, all applicable local rules and regulations, equipment manufacturer's instructions, and the National Electrical Contractor's Association (NECA) Standard of Installation. In case of discrepancy or disagreement between the documents noted above, the contractor shall satisfy the most stringent requirements.

B. Requirements set forth by first-responder code, ordinance, or the PSN AHJ shall supersede the requirements described herein and shall be met in their entirety. It is the Contractor's responsibility to ensure that the DAS complies with local code, ordinances or requirements established by the PSN AHJ.

1.06 ABBREVIATIONS AND ACRONYMS

A. ACG: Automatic Gain Control

B. AHJ: Authority Having Jurisdiction

C. ATP: Acceptance Test Plan

D. AWS: Advanced Wireless Service

E. BDA: Bi-Direction Amplifier

F. BOM: Bill-of-Material

G. BRS: Broadband Radio Service

H. BTS: Base Transceiver Station

I. CDMA: Code Division Multiple Access

J. C/N: Carrier-to-Noise Ratio

K. CWDM: Coarse Wave Division Multiplexing

L. DAS: Distributed Antenna System

M. DWDM: Dense Wave Division Multiplexing

N. ERRCS: Emergency Responder Radio Coverage System

O. EBS: Educational Broadband Service

P. ESMR: Enhanced Specialized Mobile Radio

Q. FCC: Federal Communications Commission

R. GUI: Graphical User Interface

S. iDEN: Integrated Enhanced Digital Network

T. LMR: Land Mobile Radio

U. LTE: Long Term Evolution

V. MTBF: Mean Time Between Failure

W. NFPA: National Fire Protection Association

X. NMS: Network Management System

Y. PCS: Personal Communications System

Z. PSN: Public Safety Network

AA. RoF: Radio-over-Fiber

AA. RoHS: Restriction of Hazardous Substances

BB. RSL: Received Signal Level

CC. SISO: Single-Input, Single-Output

DD. SMR: Specialized Mobile Radio

EE. SMS: Short Message Service

FF. SNIR: Signal-to-Noise Interference Ratio

GG. SNMP: Simple Network Management Protocol

HH. SOW: Statement of Work

II. VSWR: Voltage Standing Wave Ratio

JJ. WSP: Wireless Service Provider

1.07 DEFINITIONS

A. Acceptance: Expressed approval by the customer

B. Active: DAS components that require AC/DC power for operation

C. Carrier Approval: Expressed approval to interconnect to the WSP macro network

D. Channel: A path for an RF transmission between two points

E. Component: A main system element of the DAS

F. Contractor: The prime contractor bidding the project

G. Passive: DAS components that do not require AC/DC power for operation

1.08 PERFORMANCE REQUIREMENTS

A. WSP DAS:

1. On a per channel basis, the downlink RSL for each frequency band shall meet or exceed the criteria in Table 1.

Table 1: System Parameters

Parameters	**Unit**	**Lower 700 MHz, BRS/EBS**	**Cellular, PCS, AWS, Commercial 800/900 MHz**	**Public Safety 380 - 512, 700, 800 MHz**
Minimum downlink receive signal Level (RSL)	dBm	-75	-85	-95

2. Contractor shall state the assumed channel loading and frequency bands for the proposed WSP in-building coverage. Prior to installation, contractors shall confirm the channel loading and frequency use in the serving area, and shall guarantee coverage for these channels per the criteria in Table 1.
3. The DAS shall deliver coverage per the criteria in Table 1 throughout 95% of the building. The coverage areas shall include the stairwells, elevators, basement, and garage.
4. The contractor shall explain the method used to avoid downlink and uplink interference.

B. PSN DAS:

1. The PSN DAS shall comply with the latest edition or supplement or amendment thereto in effect at the time of submittal of bid of NFPA-1 .
2. Where the in-building coverage requirements include 700 - 800 MHz public safety system and commercial wireless in-building coverage, the two systems shall operate over a unified Passive Cable and Coverage Antenna Infrastructure.
3. Contractors shall state the assumed channel count for the PSN Frequency Bands identified above in Section 1.03 A. with submittal of bid response. Prior to installation, contractors shall confirm the channel count and frequencies with the AHJ, and shall guarantee coverage for these channels per the criteria stated above.
4. The DAS shall be upgradable, without additional hardware or software, to allow for changes to system frequencies within the deployed frequency band in order to maintain radio system coverage as originally designed.
5. The contractor shall explain the method used to avoid downlink and uplink interference.

1.09 ADDITIONAL REQUIREMENETS

A. WSP Approval: The Contractor shall be responsible for providing the WSP with information each WSP requires to approve interconnection of the DAS to the WSP's macro network.

B. PSN Approval: When approval of the DAS deployment is required by code or ordinance, the Contractor shall be responsible for facilitating the AHJ approval(s) per the requirements of the code or ordinance.

1.10 SUBMITTALS

A. Submittal Requirements with Bid Response:
   1. Product Data: Submit manufacturer datasheets for the following components:
      a. Donor and Coverage Antennas
      b. Coaxial Cable and Connectors
      c. Splitters, Combiners and Couplers
      d. Bi-Directional Amplifiers (BDA)
      e. Fiber-Optic Master Unit
      f. Fiber-Optic Remote Units
   1. Shop Drawings: Submit the following items:
      a. RF link budget
      b. Overlay of system Components on floor plans
      c. Drawings for Donor Antenna and grounding
      d. Bill-of-Material (BOM)
      e. Grounding Shops including calculations.
      f. Everything must be stamped and signed by a registered California Electrical Engineer.
   2. Statement of Work (SOW): Submit sample SOW
   3. Acceptance Test Plan (ATP): Submit sample ATP
   4. Recommended Spares
   5. Warranty Documents:
      a. Submit for all manufactured Components specified in this Section.
      b. Submit Contractor's System Warranty.
      c. Submit Manufacturer's Extended Warranty.

B. Submittal Requirements Prior to Start of Construction
   1. Final RF link budget
   2. Overlay of system Components on floor plans
   3. Drawings for Donor Antenna and grounding
   4. RF propagation modeling
   5. Signal to Noise Interference Ratio (SNIR) Map
   6. Bill-of-Material (BOM)
   7. Maintenance Service Contract
   8. Statement of Work (SOW): The contractor shall submit a SOW that has been accepted by the customer or customer's designated representative.
   9. Acceptance Test Plan (ATP): The contractor shall submit an ATP that has been accepted by the customer or customer's designated representative.

C. Submittal Requirements at Close Out
   1. Drawings: Submit as-built drawings indicating:
      a. Donor antenna, grounding and lighting protection details
      b. Cable routing, splitters, couplers and coverage antenna locations
      c. Active component locations, layout and configuration
   2. Test Reports
      a. WSP DAS: Submit accepted ATP reports confirming the requirements of Section 1.07 A have been met.
      b. PSN: Submit Accepted ATP reports confirming the requirements of Section 1.07 B have been met.
   3. Field Reports: Submit sweep-testing results for all cable runs.
   4. Field Reports: Submit OTDR test results for all fiber runs.
   5. Operation and Maintenance Data: Submit hardware and software manuals for all Active Components.

6. Warranty Documents:
   a. Submit for all manufactured components specified in this Section.
   b. Submit Contractor's System Warranty.
   c. Submit Manufacturer's Extended Warranty

1.10 QUALITY ASSURANCE

A. Qualifications: Contractor shall have a minimum of 5-years full-time experience executing work of similar scope and complexity.

B. Certifications:
   1. Passive Components: Contractor shall provide manufacturer certification that their personnel have been trained on the components being installed.
   2. Active Components: Contractor shall provide manufacturer certification that their personnel have been trained on the components being installed.

1.11 WARRANTY

A. Manufacturer Warranty:
   1. Splitters, Couplers and Coverage Antennas: 5-year limited warranty from date of system acceptance.
   2. Coaxial Cable and Connectors: 10-year limited warranty from date of system acceptance.
   3. Fiber-Optic Cable: 20-year limited warranty from date of system acceptance.
   4. Active Components: The earliest of 1-year limited warranty from date of system installation or 15 months from date of shipment.

B. Contractor Warranty: Contractor shall warrant the system performance as specified in Section 1.09 for 1-year.

C. Manufacturers Extended Warranty:
   1. The DAS shall be covered by a two-part certification program provided by a single manufacturer and that manufacturer's certified contractor. The certification program covers a certified system defined as a DAS installation performed by a certified contractor using components conforming to section 2.01 following all the manufactures recommendations, installation instructions and best practices. Manufacturer shall administer a follow-on program through the contractor to provide support and service to the purchaser. The first part is an assurance program, which provides that the certified system will support current and future modulation formats in the frequency bands for which it is designed, during the 20-year warranty of the certified system.
   2. The second portion of the certification is a 20-year warranty provided by the manufacturer and the contractor on all cable products within the system (fiber-optic cable, coaxial riser cable, plenum coaxial cable and associated connectors, etc.). In conflict with 1.13 A 3 where we say the fiber has a 20 year warranty
   3. In the event that the certified system ceases to support the certified application(s), whether at the time of ATP, during normal use or when upgrading to additional frequency bands, the manufacturer and Contractor shall commit to promptly implement corrective action.
   4. Manufacturer shall maintain ISO Quality Control registration for the facilities that Manufacturer the products used in the DAS.

1.12 MAINTENANCE

A. The Contractor shall provide an optional maintenance service contract, covering for a period of one-year: preventative maintenance, system monitoring, spares, fault mitigation, equipment repair, and response. time.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Specified Manufacturer: CommScope/Andrew

2.02 COMPONENTS

A. Broadband Donor Antennas: Broadband Donor Antennas shall feature a multi-band design, accommodating Cellular, PCS, LMR and AWS frequencies in a single small antenna.
   1. Electrical:
      a. Frequency bands, 806 - 960 MHz and 1710 - 2200 MHz
      b. VSWR ≤ 1.8
      c. Gain: 806-960 ≥ 10.5 dBi, 1710 - 2200 ≥ 12 dBi
      d. Maximum input power: 100 watts
      e. Polarization: Vertical
      f. Front-to-back ratio: 806 - 960 ≥ 18 dB, 1710 - 2200 ≥ 20 dB
      g. Impedance: 50 Ω
      h. Azimuth Pattern: As proposed by the manufacturer to meet the performance specifications in this Section.
   2. Mechanical:
      a. Radome material: UV-protected ABS
      b. Pigtail cable: RG58, plenum rated
      c. Connector: 50 Ω N Type Female
      d. Mounting: Pole
   3. Environmental
      a. Temperature: -40 °C to +60 °C
      b. Lighting protection: Direct ground
      c. Waterproof level: IP 66
      d. Wind Speed, maximum: 125 mph
   4. Approved Manufacturer: Andrew CELLMAX-EXT-CPU or equivalent.

B. 700 MHz LMR Yagi Donor Antennas:
   1. Electrical:
      a. Frequency band, 746 - 806 MHz
      b. VSWR ≤ 1.5:1
      c. Gain: ≥ 1 1.1 dBi
      d. Maximum input power: 100 watts
      e. Polarization: Vertical
      f. Front-to-back ratio: ≥ 15 dB
      g. Impedance: 50 Ω
      h. Beamwidth, Horizontal, degrees: 60
      i. Azimuth Pattern: As proposed by the manufacturer to meet the performance specifications in this Section.
   2. Mechanical:
      a. Connector: 50 Ω N Type Female
      b. Mounting: Pole
   3. Environmental:
      a. Temperature: -40 °C to +60 °C
      b. Lighting protection: Direct ground
      c. Waterproof level: IP 66
      d. Wind Speed, maximum: 125 mph
   4. Approved Manufacturer: Andrew DB498-PS or equivalent.

C. Omni-Directional Coverage: Omni-Directional Coverage antennas shall feature a multi- band design, accommodating multiple frequency bands in a single small antenna.
   1. Electrical Band 1:
      a. Frequency Band: 698 – 800 MHz
      b. VSWR: ≤ 1.8:1
      c. Gain: ≥ 1.5 dBi
      d. Maximum input power: 50W
      e. Impedance: 50 Ω

f. Beamwidth, Horizontal: 360° omnidirectional
g. Beamwidth, Vertical: 80° nominal Return Loss: 10.9 dB

2. Electrical Band 2:
   a. Frequency Band: 1710 – 2700 MHz and 800 – 960 MHz
   b. VSWR: ≤1.5:1
   c. Gain: ≥ 1.5 dBi @ 800–960 MHz and ≥ 5.0 dBi @ 1710 – 2700 MHz
   d. Maximum input power: 50W
   e. Impedance: 50 Ω
   f. Beamwidth, Horizontal: 360° omnidirectional
   g. Beamwidth, Vertical: 65° nominal
   h. Return Loss: ≤ 13.9 dB
3. Mechanical:
   a. Connector: 50 Ω N Type Female
   b. Mounting: Thru-hole ceiling mount
   c. Radome material: ABS, UV resistant
   d. Pigtail cable: KSR195, plenum rated
4. Environmental:
   a. Application: Indoor
   b. Operating Temperature: 40 °C to +60 °C (40 °F to +140 °F)
   c. Relative Humidity: Up to 100%
5. Regulatory Compliance/Certifications: RoHS 2002/95/EC
6. Approved Manufacturer: Andrew CELLMAX-O-CPUSE or equivalent.

D. Directional Coverage Antennas: Directional coverage antennas shall feature a multi-band design, accommodating multiple frequency bands in a single small antenna.
   1. Electrical Band 1:
      a. Frequency Band: 698 – 800 MHz
      b. b. VSWR: ≤1.8:1
      c. Gain: ≥ 5.0 dBi @ 698 – 800 MHz
      d. Maximum input power: 50W
      e. Impedance: 50 Ω
      f. Beamwidth, Horizontal: 110° nominal
      g. Polarization: Vertical
      h. Return Loss: ≤ 10.9 dB
   2. Electrical Band 2:
      a. Frequency Band: 1710 – 2700 MHz and 800 – 960 MHz
      b. VSWR: ≤ 1.5:1
      c. Gain: ≥ 5.0 dBi @ 800 – 960 MHz and ≥ 6.0 dBi @ 2170 – 2700 MHz and ≥ 8.0 dBi @ 1710 – 2170 MHz
      d. Maximum input power: 50W
      e. Impedance: 50 Ω
      f. Beamwidth, Horizontal: 90° nominal
      g. Return Loss: ≤ 13.9 dB
   3. Mechanical:
      a. Connector: 50 Ω N Type Female
      b. Mounting: 4-hole wall mounting plate
      c. Radome material: ABS, UV resistant
      d. Pigtail cable: RG58, plenum rated
   4. Environmental:
      a. Application: Indoor
      b. Operating Temperature: 40 °C to +60 °C (40 °F to +140 °F)
      c. Relative Humidity: Up to 100%
   5. Regulatory Compliance/Certifications: RoHS 2002/95/EC
   6. Approved Manufacturer: Andrew CELLMAX-D-CPUSE or equivalent.

E. Fiber-Optic Cable and Connectors:
   1. General Specifications:
      a. Cables shall be six-strand or greater, designed for point-to-point applications as well as mid-span access, and shall provide a high-level of protection for optical fiber installed in interior building environments.
      b. Higher optical fiber count cables shall utilize a sub-unitized design with color-coded subunits for easy identification.
      c. Single-mode optical fibers shall be 8.3 µm and use standard colored tight-buffered construction.
      d. The single-mode optical fiber shall be dispersion-unshifted optical fiber that meets ITU-T G.652c standards.
      e. Cable shall provide optimum performance over entire wavelength range from 1260 to 1625 nanometers.
      f. Cable shall support new and emerging applications that utilize extended E band, 1360 to 1460 nanometers.
      g. Cable shall also support existing and legacy single-mode applications that traditionally operate in 1310 and 1550 nanometer regions.
      h. Cable shall deliver a cost-effective upgrade path by expanding available wavelengths by 50 percent supporting 16 Channels of coarse wave division multiplexing (CWDM) on a single optical fiber and up to 400 Channels of dense wave division multiplexing (DWDM) on a single cable.
      i. Fire ratings: Riser, plenum, and/or LSZH
      j. Approved Manufacture: CommScope Fiber Optic Cable containing TerraSpeed Single Mode Optical Fiber. As an example, P-006-BO-8W-F25YL, 6-strand breakout cable single-mode Fiber or equal.

F. Fiber-Optic Pigtails:
   1. General Specifications:
      a. To maintain channel integrity, optical fiber patch cords and pigtails shall be fabricated to meet the performance parameters corresponding to the optical fiber cable approved product type specified below. Patch cord and pigtail plug connectors shall be equipped with boots, and shall have same colors as related optical fiber backbone cables, unless specified or indicated otherwise. Optical fiber patch cords and pigtails shall be available with the following options as specified or indicated:
         1) Termination types: SC-APC
         2) Connector/cable configuration: Simplex and duplex
         3) Fire ratings: Riser, plenum and/or LSZH
         4) Patch cord outside diameters: 1.6 millimeters (0.063 inches) and 3.0 millimeters (0.118 inches)
         5) Pigtails: Ruggedized and tight-buffered optical fiber—0.9 millimeters (0.035 inches) outside diameter
         6) Lengths: As specified or indicated
         7) Approved Manufacturer: CommScope RFT-01RF09-8W-SCA-XX, single reinforced buffered 900 µm, LightScope ZWP single-mode fiber, angled polished connector or equivalent.

G. Air Dielectric, Plenum Rated Cable:
   1. Material Characteristics:
      a. Jacket: Halogenated, Fire-Retardant
      b. Outer Conductor Material: Corrugated Aluminum or Corrugated Copper
      c. Inner Conductor Material: Copper-Clad Aluminum Wire
   2. Electrical Characteristics:
      a. Impedance: 50 ± 2.0 Ω
      b. Frequency Band: 1 - 8800 MHz

c. Peak Power Rating: ≥ 40.0 kW

3. Mechanical Characteristics:
   a. Diameter Over Jacket: ≤ .627 in
   b. Minimum Bending Radius: ≤ 5 in
   c. One Time Minimum Bending Radius: ≤ 3 in
4. Attenuation Characteristics:

Frequency (MHz)	Attenuation (dB/100ft)
150	≤ 0.848
450	≤ 1.53
800	≤ 2.105
2000	≤ 3.564

Standard Conditions: VSWR 1.0, ambient temperature 20 °C (68 °F)

5. Approved Manufacturer: Andrew HL4RP-50A, AL4RPV-50A or equivalent.

H. Foam Dielectric Cable:
1. Material Characteristics:
   a. Jacket: Non-halogenated, Fire-Retardant Ployolefin
   b. Outer Conductor Material: Corrugated Copper
   c. Inner Conductor Material: Copper-Clad Aluminum Wire or Copper Tube
2. Electrical Characteristics:
   a. Impedance: 50 ± 1.0 Ω
   b. Frequency Band: 1/2” Nominal: 1 - 8800 MHz, 7/8” Nominal: 1 - 5000 MHz
   c. Peak Power Rating: ≥ 40.0 kW
3. Mechanical Characteristics:
   a. Diameter Over Jacket: 1/2” Nominal: ≤ .630 in, 7/8” Nominal: ≤ 1.1 in
   b. Minimum Bending Radius: 1/2” Nominal: ≤ 5 in, 7/8” Nominal: ≤ 10 in
   c. One Time Minimum Bending Radius: 1/2” Nominal: ≤ 2 in, 7/8” Nominal: ≤ 5 in
4. Attenuation Characteristics: 1/2” Nominal

Frequency (MHz)	Attenuation (dB/100ft)
150	≤ 0.815
450	≤ 1.447
800	≤ 1.968
2000	≤ 3.251

Standard Conditions: VSWR 1.0, ambient temperature 20 °C (68 °F)

5. Attenuation Characteristics: 7/8” Nominal:

Frequency (MHz)	Attenuation (dB/100ft)
150	≤ 0.417
450	≤ .744
800	≤ 1.014
2000	≤ 1.683

Standard Conditions: VSWR 1.0, ambient temperature 20 °C (68 °F)

6. Approved Manufacturer: Andrew LDF4-50A, FXL-540-NHR, FXL-780-NHR or equivalent, in accordance with Section 1.03.

I. Splitters, Combiners, Couplers, Coax Jumpers and Connectors:
   1. Approved Manufacturer: Andrew or equivalent, in accordance with Section 1.03.

J. BDA: When the AHJ and/or WSP dictates a BDA drive the DAS, the BDA shall be of modular design and use digital filtering to mitigate interference and accommodate multiple services for PSNs and WSPs.
   1. Characteristics
      a. Operating Temperature Range: -33 °C to +50 °C
      b. Chassis: Shall be of modular design with ≥ 4 frequency bands per 19" chassis. Chassis shall not exceed four Rack Units (RUs) in height.
      c. Filtering: Digital
      d. Separate Control: Each RF amplifier shall be able to adjust and control power levels for each WSP when multiple WSPs share a single amplifier.
      e. FCC Part 90.219 Type Classification: Class A narrowband for LMR/SMR/ESMR frequency bands
      f. Alarming: Shall support both SNMP and SMS using wireless modem
      g. Mounting Options: shall support rack, wall and pole mounting
      h. Frequency Bands Supported: 380 - 512 MHz LMR, 769 - 806 MHz LMR, 806 - 869 MHz LMR/SMR/ESMR, 896 - 941MHz LMR/SMR/ESMR, 824 - 894 MHz Cellular, 1710 - 1755 MHz AWS, 1900 - 1950 MHz PCS
   2. Compliance:
      a. NFPA: The BDA shall comply with NFPA-1 2009 edition Annex O In- Building Public Safety Radio Enhancement Systems.
      b. FCC: Shall be FCC type certified.
   3. Approved Manufacturer: Andrew Node A or equivalent.

K. Fiber-Optic Master Unit: When building size dictates an Active fiber DAS, the Fiber- Optic Master Unit shall convert radio over coax to Radio-Over-Fiber (RoF) for distribution to Fiber-Optic Remote Units.
   1. Characteristics
      a. Transmission Media: Single-mode fiber at 1310 nm
      b. Operating Temperature Range: +5 °C to +40 °C
      c. Impendence: 50 Ω
      d. Chassis:
         1) Shall be of modular design able to support ≥ 32 Remote Units per 19", 4 RU chassis
         2) Shall support redundant power supplies
         3) Shall have the capability to remotely power the Remote Units via composite fiber-optic cable
      e. Automatic Gain Control (AGC): Shall provide AGC for optical loss compensation
      f. Optical Budget: Shall support ≤ 3 dB optical budget (~3 km or 2 miles)
      g. Auxiliary Channel: Shall provide an input to support 400 to 2700 MHz for future expandability
      h. Interlink: Shall support one fiber or two fibers bi-directional optical link for distances up to 20 km with a 10 dB optical budget
      i. Remote Supervision:
         1) Shall support the TCP/IP protocol, SNMPv2, FTP, HTTP, Telnet, and be fully compatible with general purpose SNMP managers
         2) Remote access shall be available via Point-to-Point Protocol (PPP), over circuit-switched/packet data and wired/wireless modems
         3) Each Active device shall be manageable via a Web GUI
         4) Auto Mapping: Each board position shall be automatically mapped during system turn-up

2. Frequency Bands Supported: 380 - 512 MHz LMR, 769 - 806 MHz LMR, 806 - 869 MHz LMR/SMR/ESMR, 896 - 941MHz LMR/SMR/ESMR, 824 - 894 MHz Cellular, 1710 - 1755 MHz AWS, 1900 - 1950 MHz PCS and 2496 - 2690 MHz BRS/EBS.
3. Approved Manufacturer: Andrew ION-B, ION-M or equivalent.

L. Fiber-Optic Remote Units: The Fiber-Optic Remote Unit converts the RoF signal back to radio over coax, as well as provides filtering so that multiple frequency bands can reside over the same passive cable and antenna infrastructure.
1. Characteristics
a. Operating Temperature Range: +5 °C to +40 °C
b. Impendence: 50 Ω
c. Power Consumption: ≤ 105 watts, maximum
d. Output Power per Carrier at Antenna Port:

Technology/Band (MHz)	Single carrier (dBm)
Analog 700	27
GSM 700	27
Analog 800 and 850	27
GSM 850 and 850	31
GSM 850 and 850 at band edges	29
iDEN 800 and 850	26
iDEN 800 and 850 at band edges	24
CDMA 800 and 850	29
CDMA 800 and 850 at band edges	27
Analog 900	29
iDEN 900	23
CDMA 1700	30
W-CDMA 1700	28
Analog 1900	31
GSM 1900	31
CDMA 1900	29
W-CDMA 1900	27

e. MTBF (excluding external power supply): ≥ 160,000 hours

f. Physical: The Remote Unit shall consist of the following:
1) Ingress Protection: IP31 or equivalent
2) Frequency Bands supported: 769 - 806 MHz LMR, 806 - 869 MHz LMR/SMR/ESMR, 896 - 941MHz LMR/SMR/ESMR, 824 - 894 MHz Cellular, 1710 - 1755 MHz AWS, 1850 - 1995 MHz PCS
3) Optical Port: 2xSC-APC connector (separated uplink/downlink)
4) Antenna Port: Single 50 Ω N type female connector
5) Auxiliary Ports: Two SMA female for future add-on modules

g. Uplink Noise Figure:
1) LMR 700, LMR 800, Cell850: ≤ 7.5 dB
2) LMR 700, LMR 800, Cell850 at band edges: ≤ 9.5 dB
3) LMR 900: ≤ 8.5 dB

4) AWS: ≤ 7.5 dB
5) PCS 1900 extended: ≤ 7.5 dB

2. Approved Manufacturer: Andrew ION-B, ION-M Series or equivalent.

PART 3 – EXECUTION

3.01 INSTALLATION

A. The contractor shall design, install, commission and test the DAS in accordance with the manufacturer's instructions and recommendations.

B. The contractor shall install the DAS in accordance with the accepted SOW.

3.02 ACCEPTANCE TESTING

A. Acceptance testing will be performed confirming the requirements of Section 1.09 have been met.

B. The contractor shall complete the acceptance testing as prescribed in the approved Acceptance Test Plan (ATP) submittal.

END OF SECTION

SECTION 28 00 00
ELECTRONIC SECURITY AND SAFETY

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes general administrative and procedural requirements for Division 28 Sections, and is intended to supplement, not supersede, the requirements specified in Division 1.

1.02 RELATED SECTIONS

A. General: Consult all other Sections, determine the extent and character of related work, and properly coordinate work specified herein with that specified elsewhere to produce a complete and operable system.

B. Related Sections:

1. Section 28 05 53: Identification for Electronic Security and Safety
2. Section 28 13 00: Access Control System
3. Section 28 23 00: Video Surveillance System

C. General and Supplementary Conditions: Drawings and general provisions of Contract and Division 1 of the Specifications, apply to Division 28 Sections.

1.03 REFERENCES

A. Reference to codes, standards, specifications and recommendations of technical societies, trade organizations and governmental agencies shall mean that latest edition of such publications adopted and published prior to submittal of the bid. Consider such codes or standards a part of this Specification as though fully repeated herein.

B. Codes: Perform work in accordance with all applicable requirements of the latest edition of all governing codes, rules and regulations including but not limited to the following minimum standards, whether statutory or not:

1. National Electric Code (NEC), NFPA 70.
2. California Code of Regulations (CCR) Title 24, California Building Standards Code Part 2, Basic Building Regulations and Part 3, California Electrical Code (CEC).
3. California Building Code (CBC).
4. California Fire Code (CFC).
5. California Mechanical Code (CMC).
6. National, State and any other binding building and fire codes.
7. FCC Regulations:
    a. Part 15 – Radio Frequency Devices & Radiation Limits
8. Underwriter's Laboratories (UL): Applicable listing and ratings.
    a. UL 294: Access Control System Units
9. Electronic Industry Association (EIA) testing standards
10. Americans with Disabilities Act (ADA)
11. American Standard Code for Information Interchange (ACSI)
12. American Society for Testing and Materials (ATSM)
13. National Electrical Manufacturers' Association (NEMA)
14. National Fire Protection Association (NFPA)

C. Make a copy of each document readily available during the course of construction for reference by field personnel.

1.04 DEFINITIONS

A. The Definitions of Division 1 shall apply to the Division 28 Sections.

B. In addition to those Definitions of Division 1, the following list of terms as used in this specification shall be defined as follows:

C. "Furnish": To purchase, procure, acquire, and deliver complete with related accessories.

D. "Install": To set in place, join, unite, fasten, link, attach, set up or otherwise connect together and test before turning over to the Owner, all parts, items, or equipment supplied by contractor. Installation shall be complete and ready for regular operation.

E. "Provide": To furnish, transport, install, erect, connect, test and turn over to the Owner, complete and ready for regular operation.

F. "Connect": To install all required patch cords, equipment cords, cross-connect wire, etc. to complete an electrical or optical circuit.

G. "As directed": As directed or instructed by the Owner, or their authorized representative.

H. "Cabling": A combination of all cables, wire, cords, and connecting hardware [e.g., cables, conductor terminations, connectors, outlets, patch panels, blocks, and labeling].

I. “ACS”: Access Control System

J. “VSS”: Video Surveillance System

1.05 SYSTEM DESCRIPTION

A. Overview

1. Access Control System (ACS) (Section 28 13 00)

a. Provide new access control equipment to support the devices to be installed as shown on the drawings.

b. Program the system to permit card holders access to entry doors as authorized by location, time zone, and other parameters as determined by the Owner.

c. The ACS shall control electric door locks and strikes, and other devices as shown on the Drawings.

d. Provide connection to integrated wireless card reader/electrified locks as specified in Division 8.

e. The ACS shall be administered from an Owner-provided workstation connected to the City LAN. Provide all required ACS software and programming at the Owner-provided workstation location.

f. Conduit, Back boxes and infrastructor for the access control system shall be installed as part of this project.

2. Video Surveillance System (Section 28 23 00)

a. Provide cameras, enclosures, and accessories at locations shown on drawings, complete with conduit and cabling.

b. Cameras shall be IP-Based. Configure initial camera IP addresses, stream bitrate, framerate, and resolution. Coordinate camera configuration parameters with the Owner.

c. Contractor shall provide all required camera licenses for new cameras to connect to new NVR. The Owner will retain ownership of all system licenses.

d. Connect sameras to Owner-provided Power Over Ethernet (POE) switches in the Security Electronics or TR Closets.

B. Drawings

1. Layout: Follow the general layout shown on the Drawings except where other work may conflict with the Drawings.

2. Accuracy: The Drawings show a diagrammatic representation of the system within the constraints of the symbology applied.
3. The drawings do not fully represent the entire installation for the Security Systems. Drawings indicate the layout and location of control components, as well as location of security devices, i.e. card readers, door locks and contacts, motion detectors, etc. The drawings do not show all conduits, wire and cabling between every system component, equipment, device, etc. Provide all related equipment required for a complete and functional system.

1.06 SUBMITTALS

A. General: Submit required submittal(s) in accordance with General Conditions of the Contract, and Division 1 Submittal Procedures.

B. Cover Letter: Include a cover letter stating that the submittal is in full compliance with the requirements of the Contract Documents. List in full the items and data submitted, signed (and stamped, if applicable) by the person who prepared the submittal. Failure to comply with this requirement shall constitute grounds for rejection of submittal.

C. Submittal Description: Product Data
   1. General: Product data submittals must be approved by the Owner prior to release of order for equipment and prior to installation.
   2. Quantity: As noted in Division 1.
   3. Format:
      a. Provide product data submittal as an electronic PDF file with a clear description of the submittal information in the file title.
      b. Include a Table Of Contents at the beginning of the submittal that lists materials by article and paragraph number found in the section and in the order outlined in the specification (e.g., “2.03-b Card Reader”).
   4. Content:
      a. Product Information:
         1) Include product data consisting of manufacturer's technical data, product literature, "catalog cuts", data sheets, specifications, and block wiring diagrams (if necessary). This data shall clearly describe the product’s characteristics, physical and dimensional information, electrical performance data, materials used in fabrication, material color & finish, and other relevant information such as test data, typical usage examples, independent test agency information, and storage requirements.
         2) Clearly indicate by arrows or brackets precisely what is being submitted on and those optional accessories, which are included and those which are excluded.
         3) Include delivery dates for equipment.

D. Submittal Description: Shop Drawings
   1. General: The Owner must approve shop drawings prior to release of order for equipment and prior to installation.
   2. Quantity & Media: Furnish quantity and on media specified in Division 1.
   3. Content:
      a. Floor Plans:
      b. Floor and site plans showing the locations of all devices and door furniture associated with each door locations (ex: contacts, rex locks, card readers) and cable routing paths with cable type and quantity called out. Prepare cable schedule if required to simplify sheet plan notation

c. Provide termination information for each device on the plans or in a schedule that identifies the physical connections to the equipment panels. Include the panel address, and the termination point ID that is consistent and reflective of the programming fields.

4. Point-to-Point Diagrams: Include all wiring, points of connection and interconnecting devices.
   a. Include all miscellaneous control relays.
   b. Include all devices connected to the system.
   c. Identify all conductors on the point-to-point diagrams with the same tag as the installed conductor.
5. Block Diagram/Riser Diagram: Show the system components and all conduit and wire types and sizes between them including all cabling interface between termination hardware.
6. Installation Details: Include installation details for all devices.
7. Seismic Calculations: As part of the shop drawings submittal where applicable, the manufacturer shall provide anchorage calculations for floor mounted fully loaded distribution frames such that it shall remain attached to the mounting surface after experiencing forces in conformance with Section 2312 "Earthquake Regulations" of the "Uniform Building Code" for Seismic Zone 4 Area, Importance Factor of 1.25. Structural Calculations shall be prepared and signed by a Registered Structural Engineer. Specify proof loads for drilled-in anchors, if used. Seismic calculation shop drawings shall be wet stamped and signed by a registered structural engineer.
8. Calculations:
   a. Battery calculations for all batteries.
   b. Voltage-drop calculations for all lock circuits and fire alarm Notification Appliance Circuits.

E. Submittal Description: Labeling Sample
   1. Quantity & Media: Furnish quantity indicated in Division 1.
   2. Submit two sets of physical product samples for review and comment by Owner prior to the installation of equipment:
   3. Content:
      a. Provide panel label
      b. Provide cable label on a cut length of cable.

F. Submittal Description: As-Built Drawings
   1. Quantity & Media: Submit four sets of Record Drawings.
   2. Upon receipt of the Owner’s review comments, make corrections and furnish the following as-built drawings:
      a. Four half-size sets on bond (or “eco-bond”).
      b. One USB Memory Stick or similar portable storage media.
      c. One 11x17 set in the Record Documents Manual.
      d. Drawings become Owner’s property and shall maintain all ownership rights.
   3. Format:
      a. Prepare as-built drawings using AutoCAD *.dwg format.
      b. All system components (devices, cable routes, etc.) and text shall be plotted at a sufficient line weight to stand out against background information.

4. Content:
    a. Fully represent actual installed conditions and incorporate all revisions made during the course of construction.
    b. Include drawings submitted as part of the Shop Drawing package, plus any additional information required to accurately document installed conditions.
    c. Device addresses & IP address information.
    d. Floor plans shall show:
    e. Locations and identifiers of all devices.
    f. Size, quantity, location, and routes of all pathways (such as cable trays, conduits, J-hangers, and other cable support devices).
    g. Equipment room floor plans scaled at 1/2”=1’-0” showing exact placement of all equipment cabinets/frames, rack bays, and other equipment.
    h. Wall elevations scaled at 1”=1’-0” showing exact placement of all security system hardware.
    i. Installation details.

G. Submittal Description: Operation and Maintenance Manuals
1. Quantity: Furnish four O & M Manuals.
2. Format:
    a. Furnish each O & M Manual in a white, 3-ring binder with front cover and spine clear pockets for insertion of the project information.
    b. Clearly label the cover of each O & M Manual with the following information:
        1) Client Name.
        2) Project Name and Address.
        3) Manual Name (e.g., “Operation And Maintenance Manual for ACAMS System).
        4) Date of Submittal. Format: <month> <day>, <year> (e.g., “January 1, 2017”).
        5) Contractor Name.
    c. Include a Table Of Contents at the beginning that lists the contents.
    d. Include tabbed separators for improved navigation through the manual.
3. Content:
    a. Functional Design Manual: Includes a detailed explanation of the operation of the system.
4. Hardware Manual which includes:
    a. Pictorial parts list and part numbers.
    b. Pictorial and schematic electrical drawings of wiring systems, including devices, control panels, instrumentation and annunciators.
    c. Telephone numbers for the authorized parts and service distributors.
    d. Include all service bulletins.
5. Operator’s Manual which fully explains all procedures and instructions for the operation of the system and includes:
    a. System start up and shut down procedures.
    b. Use of system.
    c. Equipment recovery and restart procedures.
6. Maintenance Manual which includes:

a. Instructions for routine maintenance listed for each component, and a multi-page summary of all components' routine maintenance requirements.

b. Detailed instructions for repair of the security system.

c. A summary of the TCP/IP address used and which system component they are associated with. Include the gateway address, subnet mask, DNS server, and host name information.

d. Manufacturer's warranty certificates.

7. Record Drawings Manual: 11"x17" prints of Record Drawings, as described above.

H. Resubmittals: Include a cover letter listing the action taken and revisions made to each product submittal in response to Submittal Review Comments. Resubmittal packages will not be reviewed unless accompanied by this cover letter. Failure to include this cover letter will constitute rejection of the resubmittal package.

I. Submittals must be complete. Owner reserves the right to reject any submittals determined to be incomplete.

1.07 QUALITY ASSURANCE

A. All equipment supplied shall be listed by a nationally recognized test laboratory where applicable.

B. All equipment and accessories to be the product of a manufacturer regularly engaged in its manufacture.

C. All items of a given type shall be the products of the same manufacturer.

D. All items shall be of the latest technology; no discontinued models or products are acceptable.

E. The manufacturer, or their Authorized Representative, shall confirm that within 300 miles of the project site there is an established agency which:

1. Stocks a full compliment of parts

2. Offers service during normal working hours as well as emergency service on all equipment to be furnished

3. Will supply parts and service without delay and at reasonable cost.

4. Contractor shall be capable of performing service or maintenance work on these specified or accepted systems. Contractor shall be factory-certified where such certification is available.

1.08 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery

1. Do not deliver products to the site until protected storage space is available. Coordinate delivery of materials with scheduled installation date to allow minimum storage time at jobsite.

2. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels (name of the manufacturer, product name, type, grade, UL classification, etc.) intact.

3. Replace materials damaged during shipping at no cost to the Owner.

B. Storage

1. Store materials in clean, dry, ventilated space free from temperature and humidity conditions (as recommended by manufacturer) and protected from exposure to harmful weather conditions.

2. Comply with manufacturer's requirements for each product. Comply with recommended procedures, precautions or remedies as described in the Material Safety Data Sheets (MSDS) as applicable.

3. Maintain factory wrapping or provide a heavy canvas/plastic cover to protect units from dirt, water, construction debris, and traffic.
4. Storage outdoors covered by rainproof material is not acceptable.
5. Provide heat where required to prevent condensation or temperature related damage.

C. Handling
1. Handle in accordance with manufacturer's written instructions.
2. Damaged equipment shall not be installed.
3. Replace damaged equipment at no cost to the Owner.
4. Handle with care to prevent internal component damage, breakage, denting, and scoring.

1.09 SUBSTITUTIONS

A. All materials and equipment shall conform to these specifications. No substitute materials may be used, unless previously accepted in writing by the Architect.

B. Manufacturers listed as acceptable are normally engaged in the type of work specified. The listing of equipment part numbers or particular types of systems by specific manufacturers is to establish the performance quality, type, and parameters of the equipment and material specified.

1.10 WARRANTY

A. Installation, equipment, and all parts and labor are guaranteed by Contractor and manufacturer for one year from written notification of acceptance by the Owner.

B. The installing Contractor shall provide, upon notification of a problem, a field service technician to correct the problem within 24 hours of notification.

PART 2 PRODUCTS

2.01 SECURITY SYSTEM PRODUCTS

A. Refer to individual Security System sub-sections for product details.

2.02 SPARE PARTS

A. Prior to completion of the job, provide spare parts to Owner as detailed in each System sub-section.

PART 3 EXECUTION

3.01 REQUIREMENTS

A. Systems shall be complete and operational in all respects.

B. Provide all conduit, conductors, etc. for all building Systems. All wiring shall be in conduit unless shown otherwise on the drawings.

C. Wiring and conduit shown on drawings represents a minimum requirement. Contractor shall furnish and install all wiring and conduit recommended by submitted system manufacturers' for optimum system performance at no additional cost to the Owner.

D. Connect power to Systems as required.

E. All equipment, junction boxes, terminal cans, etc. shall be installed utilizing tamper proof mounting hardware. Provide a minimum of 2 driver bits or hand tools for each type of security fastener provided.

F. Provide seismic restraint for all equipment, including equipment racks, consoles, etc. Refer to Division 16 for seismic restraint requirements.

G. Refer to individual Security System sub-sections for additional installation requirements.

3.02 TRAINING

A. As a part of this contract, provide training as described herein and detailed under each System sub-section.

B. Training shall be by engineers or technicians highly skilled in the systems and certified by manufacturer as qualified to train in the associated systems.

C. Training shall be conducted at dates and times directed by the Owner's representative. Initial training shall be provided for the security director and consultant. Upon their approval, a second training session shall be provided for security officers. An additional training session for officers shall be provided within the first year after system acceptance. Provide specific training sessions for Owner's maintenance personnel. After-hours training shall be provided at no additional cost if requested by the Owner.

D. Verification of completion of training is required by the Owner prior to release of retention compensation.

3.03 PROGRAMMING

A. Provide initial programming for access control system. Programming shall include, but not be limited to:

1. English-language description of each alarm point.
2. Access Control System alarm-based camera call-up.

B. Submit to the Owner's Representative for Owner's review proposed programming, including device names and descriptions, timings, sequence of operations, sample audio messages, etc.

C. Upon Owner's request, ACS shall be reprogrammed by the Building Security Electronic Systems Contractor one time during the warranty period at no additional cost.

3.04 COMMISSIONING, ACCEPTANCE TESTING AND REPORTS

A. There are two distinct types of tests for which the Contractor is responsible:

1. The first type is the Pre-functional Performance Test. These tests ensure that all equipment, wiring, and systems are installed in accordance with the Specifications, Plans, and Manufacturers' requirements.
2. The second type of test is the Functional Performance Test. These tests ensure that all equipment and systems operate in accordance with design intent. These are dynamic tests and test the systems through all possible modes of operation.

B. Provide a written testing plan describing proposed duration and schedule for performing pre-functional performance tests and functional performance tests in spreadsheet format listing each and every device, cable/wire, and software point to be tested. Submit the testing plans for approval prior to commissioning and acceptance testing.

C. Perform systems tests using personnel who have attended a manufacturer's training school for installation and testing of the systems as described above. Perform testing with the test instruments as required by the manufacturer; testing by means other than the manufacturer's procedures will not be acceptable unless agreed to by the Engineer and manufacturer.

D. Upon completion of the installation of the Security Systems, the contractor shall perform 100% testing and submit pre-functional reports including, but not limited to, the following information in spreadsheet format:

1. A complete list of all equipment installed, including serial numbers of major components.
2. Certification that all equipment is properly installed and functional and conforms with contract Specifications and Plans.
3. Test reports of all inputs and outputs, devices, and equipment.
4. Test technician's name, company, and dates of test.

E. Following review of the Pre-functional test reports by the Engineer, the contractor shall perform a functional test of all Security System equipment in the presence of the Engineer. Test shall include performance tests of each device, switch, control unit, power supply, battery standby unit, monitor panel, controller, printer, and all other equipment and material required by the contract.

At a minimum, perform tests to demonstrate that:

1. All systems are free from grounding and open circuits.
2. Each alarm-initiating device consistently functions as specified and produces the specified alarm actions.
3. An abnormal condition of any circuit or device required to be electrically supervised will result in activating the specified trouble or tamper alarm signal.
4. Systems operate properly during and while on emergency generator power.
5. Alarm signals are audible at the monitor.
6. The system is operable under specified trouble conditions.
7. All software functions properly as specified, and all equipment is fully programmed. The contractor shall be responsible for programming system English-language descriptors as specified by the Engineer.
8. System as-built drawings correspond with actual installation.

F. If retesting is required due to contractor equipment failure, incorrect programming, omission, error, etc., the contractor shall compensate the Engineer for all owner costs associated with retesting.

G. Sixty days prior to expiration of warranty, Contractor shall retest all systems as described above, and submit a test report of findings. All items covered by warranty shall be corrected immediately. Warranty remains in effect until the Contractor corrects 100% of defective items.

H. Provide all software and current files and access codes for all programmable equipment.

END OF SECTION

This page intentionally left blank

SECTION 28 08 00
COMMISSIONING OF SECURITY SYSTEMS CONTROLS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Section 01 91 13, General Commissioning Requirements

B. All Division 28 Sections pertaining to Security Systems.

1.02 REFERENCES

A. Inspections and acceptance tests shall be performed in accordance with applicable codes and standards, including the most current versions of NEC, ANSI, IEEE, NFPA, NEMA, OSHA, NETA and ATS.

1.03 DEFINITIONS

A. Access Control and Alarm Monitoring System (ACAMS): System to monitor and control access to secure spaces on the building property.

B. Commissioning Report (Cx Report): The final report issued at the conclusion of the commissioning process. The report includes an executive summary abbreviating the outcome of the commissioning process and identifying all outstanding issues. The report also contains all commissioning documentation collected throughout all phases of the project.

C. Design Professional (DP): Architects, engineers and other consultants involved in the project design.

D. Duress Alarm Button: An electronic pushbutton installed in a location where persons may need to communicate distress. Also referred to as a Help Button.

E. Facility Security Plan (FSP): A document that describes the design goals and decisions that led to the ultimate security design of the facility. This document combines physical design, operation and technology to achieve the security goals and requirements for the facility. Both the Owner's desired security requirements and the design team's solutions to achieve these requirements should be documented in the FSP, along with any technical justification for the design.

F. General Contractor (GC): a person or business entity contracted to be in charge of this building project.

G. Security Intercom: Intercom system for communications of security personnel for general building security communications and door control.

H. Video Surveillance System (VSS): Camera video system dedicated to providing live and recorded video of cameras located on the building property.

I. Warranty Phase: The phase of the project immediately after the initiation of the building equipment warranty which spans the entire length of the equipment warranty.

1.04 DESCRIPTION OF WORK

A. This specification covers the commissioning of the security systems for this project, including, submittal review, preliminary testing (pre-functional tests), functional performance testing, deficiency and resolution tracking, O&M documentation tracking and training verification.

B. Systems and equipment to be commissioned:

1. Access Control System
2. Video Surveillance System

C. Systems and equipment NOT included in commissioning for this project:
   1. Metal detectors
   2. X-ray machines

D. The work includes the completion and documentation of formal commissioning procedures by the GC and Trade Sub-Contractors.
   1. Commissioning (Cx) is defined as the process of verifying and documenting the installation and performance of selected building systems to meet the specified design criteria and contract documents, thereby satisfying the design intent and the Owner's requirements and operational needs.
   2. The Design Professionals, GC and Trade Sub-Contractors will provide the quality control for the design, installation, startup and checkout of the systems. The commissioning process provides review and qualitative functional testing in order to formally observe and document that the quality control efforts are successfully completed.
   3. Refer to Section 019113, General Commissioning Requirements for summary description of the general commissioning process and requirements.
   4. The Trade Sub-Contractors and the factory authorized service representatives shall be responsible for participation in the commissioning process as outlined in this specification and Section 019113 General Commissioning Requirements, and as directed by the CxC as overseen by the CxA.
   5. The Trade Sub-Contractors and/or factory authorized service representatives shall furnish and maintain tools, instruments, material, test equipment, test connections and power for the testing required. The personnel provided by the Sub-Contractor and/or factory authorized service representatives shall provide supervision and technical labor capable of executing the tests, operating the equipment and adjusting the system hardware and software.

1.05 COMMISSIONING PROCESS

A. Submittal Review by the CxA
   1. The CxA will review the Trade Sub-Contractor's submittals for the appropriate systems in the commissioning scope, concurrently with the Design Team and will provide review comments to the Design Team.
   2. The GC shall provide a submittal log to the CxA for referencing requested submittals to be reviewed by the CxA (for which the GC shall issue to the CxA concurrently with the submission to the Design Professionals). Alternatively, the GC shall include the CxA on the distribution of all Trade Sub-Contractor submittals issued to the Design Professionals, for systems applicable to this specification.
   3. The GC shall issue the requested submittals to the CxA for review at the same time they issue the submittals to the Design Team.
   4. The CxA will use the information from the submittals to develop commissioning forms and test procedures.
   5. The Trade Sub-Contractors shall provide, wherever the Contract Documents require, system checks and testing, test reports, factory test data and reports, checklists, operational verifications and demonstration, etc., whether specified or not in the commissioning sections.

B. Cx Plan and Form Development
   1. The CxA prepares a Preliminary Cx Plan during the project final design phase. The Cx Plan provides guidance in the execution of the commissioning process during construction.

2. Commissioning during construction begins with a kickoff meeting conducted by the CxA where the CxA reviews the commissioning process and systems. The CxA presents the Preliminary Cx Plan and discusses and implements the project specific requirements and responsibilities.
3. The CxA develops the SRC forms which list and track the completion of the IV, Startup, and PFCs required for each system and equipment to be commissioned. The CxA provides the SRC forms to the GC and Trade Sub-Contractors for review and comment.
4. The CxC shall submit to the CxA, for review and approval, representative blank forms for completing IV, Startup, and PFCs.
    a. IV forms provide field verification and documentation of proper installation of equipment and system prior to formal Startup. Where appropriate, these forms may be combined with the Startup and PFC forms. The GC and Trade Sub-Contractors can use checklists taken from the Manufacturer's installation manual, where appropriate.
    b. Startup and PFC forms primarily consist of Manufacturer and Trade Sub-Contractor startup and checkout sheets and shall be used where required and appropriate. Where applicable, these forms shall include checks of the equipment controls including sensors and control devices.
    c. The PFC forms shall also include forms for recording results from system specific tests such as pipe system pressure tests, duct leakage tests, mechanical system TAB, etc.
5. The CxA will develop FPT procedures and forms and provide the forms to the GC and Trade Sub-Contractors for review and comment.
6. The CxA will update and finalize the Cx Plan with equipment specific documentation and SRC and FPT forms.

C. Functional Testing
1. Functional Performance Tests (FPTs) shall be written to test the functionality of the systems as specified in their relative Division 28 sections. A sampling of the base functions and optional features specified will be tested for performance.
2. Functional Performance Tests (FPTs) test the dynamic function, performance and control of the equipment and systems under various modes of operation. These tests verify the correct implementation of the sequences of operation and also that the system performance meets the design intent criteria. FPTs include the following types of tests, where applicable:
    a. Sequence of Operation Tests
    b. Performance Verification Tests
    c. Trend Analysis (Log Review)
    d. Integrated Systems Tests
3. The CxA will review the final checkout/test forms provided by the trade sub-contractor and/or factory authorized representative. If the provided forms cover all aspects of testing that are required for commissioning, then those forms will be used for the testing and the CxA will witness the execution of a sampling of the checkouts and tests. If there are features or base functions not covered in the provided forms, the CxA will develop FPT forms that contain the missing tests. The tests are required to contain at least the following:
    a. Specific step-by-step procedures to execute the test in a clear, sequential and repeatable format, including any control system point value or setpoint overrides required to simulate a test condition or sequence mode.

b. The expected system response and acceptance criteria of proper performance with a Yes/No check box to allow for clearly marking whether or not proper performance of each part of the test was achieved.

c. A section for recording actual system response, notes and comments.

d. Any definitions of control system trend data to be collected and provided to the CxA in electronic format for analysis and review.

4. Once the GC completes the SRC forms, the Trade Sub-Contractors execute the FPTs and the CxA witnesses a sample, as defined in the Cx Plan. The FPTs may be achieved by any combination of manual testing, monitoring or trending.

a. If the FPTs are identical to the tests performed in the PFCs (as determined by the CxA), the completed PFC forms can be attached to the FPT as documentation of 100% completion of the FPTs by the Trade Sub-Contractor. The sample set of FPTs shall then be executed by the Trade Sub-Contractor and witnessed by the CxA.

b. Any witnessed sampling of the FPTs that do not pass shall require the Trade Sub-Contractor to resolve the issue for all equipment and a new sample of the FPTs shall be executed and witnessed by the CxA. The CxA shall deem the FPTs acceptable after resolution of all issues and any witnessed sampling of tests has passed.

D. O&M Manuals, Training Verification and Final Documentation

1. The GC shall compile and complete the Operations & Maintenance (O&M) Manuals provided by the Trade Sub-Contractors, per the contract documents requirements. The CxA will verify that the O&M manuals have been delivered to the Owner per the contract requirements and may request electronic copies of the O&M Manuals.

2. The GC shall submit a training schedule and specific training agendas provided by the Trade Sub-Contractors for each training class, to the CxA and Owner for review prior to conducting any training. The CxA will review and provide comment to the Owner and GC on the specified training agendas. The CxA will verify completion of the training by receiving a copy of the training sign-in sheets, provided by the GC**.**

3. The CxA will complete the Final Construction Phase Cx Report and documentation for the Owner with assistance from the General Contractor and Trade Sub-Contractors.

1.06 COMMISSIONING TEAM

A. The Commissioning Team is responsible for performing the process and achieving successful commissioning results. The Commissioning Team is comprised of the following:

1. Owner and Owner’s Representatives
2. Design Professionals (DP)
3. Commissioning Authority (CxA).
4. General Contractor (GC)
5. GC’s Commissioning Coordinator (CxC)
6. Trade Sub-Contractors responsible for systems covered in this section include:

a. Security Alarm Contractor

b. Video Surveillance System Contractor

c. Access Control System Contractor

1.07 RESPONSIBILITIES

A. General.

1. The Commissioning Team and all others involved in the commissioning process shall follow the Commissioning Plan, attend the commissioning kickoff meeting, and attend additional commissioning meetings as necessary.

B. Commissioning Authority (CxA)

1. See Section 019113, General Commissioning Requirements.

C. Design Build Entity:

1. See Section 019113, General Commissioning Requirements.

D. Trade Sub-Contractors – General Requirements:

1. Provide commissioning submittal data, including manufacturer's installation checks and startup procedures, commissioning forms, and any other requested contract documentation for systems to be commissioned. Electronic files are acceptable.
2. Attend commissioning meetings as directed by the CxA and GC's CxC to facilitate the commissioning process.
3. Assign personnel with expertise and authority to act on behalf of the GC and schedule them to participate in and perform assigned commissioning tasks.
4. Demonstrate and document proper system installation, startup and performance. Complete all IV, Startup and PFC documentation clearly and legibly. Provide a copy of all forms to the CxC and CxA as part of completing the SRC forms.
5. Provide access for the CxA to witness any equipment Startup and PFCs. Notify the CxC and CxA at least 10 days in advance of Startup and PFCs.
6. Ensure that any required manufacturer's representative field tests and on-site IV, startup and checkout of selected equipment are performed per the contract documents, and that the CxA is notified 10 days before these activities occur. Provide completed manufacturer documentation and commissioning forms for these activities to the CxC.
7. Address Trade Sub-Contractor applicable Cx Issues and Deficiencies promptly. All IV, Startup and Pre-Functional issues must be resolved before the FPT can proceed.
8. Assist CxA in preparing the FPT procedures, clarifying the operation and control of commissioned equipment where the specifications, control drawings or equipment documentation are not sufficient for writing detailed testing procedures.
9. Review the FPT procedures to ensure feasibility, safety and equipment protection, and provide necessary written alarm limits and overrides to be used during the tests.
10. Setup any additional software points, global commands, overrides of any sensor values or relays, and overrides of any setpoints or schedules, to simulate certain conditions and operating modes, in order to conduct the FPTs.
11. Perform all FPTs (no sampling is allowed). The CxA shall witness a sample of the FPTs being executed, and fully document their results. The Trade Sub-Contractor shall complete and fully document the remainder of the FPT tests with the CxC.
12. Assist the CxA in collecting all requested Trend and/or Security Log data associated with FPTs.
13. Prepare a training agenda for each training class (to be reviewed by the CxA) and work with the GC and Owner to schedule training. Execute training of Owner's personnel per approved training agenda and schedule.
14. Prepare O&M Manuals according to the Contract Documents.

E. Trade Sub-Contractors – Specific Security and Detention System Control Requirements

1. In addition to the general Trade Sub-Contractor responsibilities outlined above, the controls Trade Sub-Contractor responsibilities during commissioning shall include, but are not limited to:

a. Provide approved submittals, prior to any controls construction activity, including shop drawings, control drawings, points list and detailed sequences of operation for each piece of equipment and system to be controlled. The system sequence of operation shall fully describe their equipment components and functionality, including setpoints, failure modes and alarm functions. The detailed sequence of operation shall be provided regardless of the completeness and clarity of the sequences in the controls specification and/or drawings. Electronic files are acceptable.

b. Provide a complete control points list in MS Excel or other pre-approved format. Points list shall include point name, point description, sensor or actuator type, panel identification, point type (AI, AO, BI, BO, virtual/software), field device controlled (through network, dry contact, actuator limit switch or other specific equipment), and associated alarm points and parameters, etc. The Trade Sub-Contractor shall make all points available for continuous trending.

c. Provide control system diagrams showing all control points, sensor locations, actuators, and controllers.

d. Provide a list of test metering and sensors to be used for calibration purposes. The list shall include test meter and sensor accuracy for comparison to the sensor accuracy requirements specified in contract documents. And all test meter and sensors shall have been calibrated within a year and have calibration documentation.

e. Provide control system IV and PFCs (and associated documentation) that include checking sensor installation; program setup check (point type, range/scale, etc.); point-to-point checks; sensor calibration or checks; and actuator checks.

f. If the facility has emergency backup power, it may require an integrated whole building test. This test requires disconnecting the utility power to the building, and it involves multiple disciplines across the scope of the project. All Security Trade Sub-Contractors shall participate in the FPTs as required for operation of the inter-related systems.

g. The control systems Trade Sub-Contractor shall set up the appropriate Trends per the final FPT forms provided by the CxA and shall provide trend data into a usable electronic format, such as a text, CSV or Excel format to the CxA. The CxA will analyze and review the trend data as part of the FPT. These trends shall be setup prior to conducting any sequence of operation functional tests. 1) The trend points list may include both hardware (inputs, outputs) and virtual / software points. The appropriate trend intervals and minimum duration will be provided on the FPT forms.

h. The Controls Trade Sub-Contractor shall also provide trend data to the CxA during the post-occupancy warranty phase for review by the CxA, where required.

1.08 SUBMITTAL REQUIREMENTS FOR COMMISSIONING

A. The Trade Sub-Contractors shall submit to the CxA representative, blank forms for IV, Startup and PFCs.

1. The CxA will review these submitted commissioning forms for completeness including any project specific requirements.

2. The CxA may request additional data, changes and/or additions to these forms to confirm completion prior to their use. If the Trade Sub-Contractor cannot submit sufficient forms, the CxA will provide forms based on the construction documents and specifications, manufacturer installation manuals and procedures, and/or industry standards or guidelines.

B. The Trade Sub-Contractors shall submit to the CxA any equipment and construction submittals and shop drawings, including detailed sequences of operation, as requested by the CxA.

PART 2 PRODUCTS

2.01 TEST EQUIPMENT

A. The Trade Sub-Contractor shall provide all test equipment in sufficient quantities to execute all Pre-Functional and Functional Performance Tests in an expedient fashion.

B. The test equipment shall be of industrial quality and suitable for testing and calibration with accuracy within the tolerance necessary to demonstrate system performance per the Contract Documents.

C. The test equipment shall have calibration certification per equipment manufacturer's interval level or within one year if not otherwise specified. The calibration tags shall be affixed or certificates readily available for all test equipment.

PART 3 EXECUTION

3.01 SYSTEM READINESS: INSTALLATION VERIFICATION, STARTUP, PRE-FUNCTIONAL CHECKS & TESTS

A. The GC and Trade Sub-Contractors shall conduct all tests and Startup procedures without compromise to human or equipment safety. The GC and Trade Sub-Contractors shall be responsible for the liability and safety of conducting all tests and Startup.

B. The GC shall clearly identify and list any Deficiencies resulting from the IV, Start-up and PFCs on the associated forms and immediately notify the CxA. Once Deficiencies are corrected and verified or tested, update and resubmit the associated forms.

C. The CxC and Trade Sub-Contractors shall provide a minimum 10 day's notice to the CxA for witnessing equipment Startup and PFCs.

3.02 FUNCTIONAL PERFORMANCE TESTS

A. The GC and Trade Sub-Contractors shall perform and document functional testing for 100% of all equipment in the scope of commissioning. At the discretion of the CxA and per the approved Cx Plan, the CxA may witness a percentage (sample) of the functional tests for selected, multiple identical pieces equipment (example: door switches, push bars, etc).

1. If the FPTs are identical to the tests performed in the PFCs (as determined by the CxA), the completed PFC forms can be attached to the FPT as documentation of 100% completion of the FPTs by the Trade Sub-Contractor. The sample set of FPTs shall then be executed by the Trade Sub-Contractor and witnessed by the CxA.

B. The FPTs will be organized into the following types of tests:

1. Sequence of operation tests including failure modes, safeties and loop tuning, which are typically the first set of tests conducted.
2. Performance verification tests.
3. Trend analysis (Log Review)
4. Integrated systems tests where applicable (i.e.: Intercom/Camera call-up, etc)

C. The GC and Trade Sub-Contractors shall have responsibility for the liability and safety of conducting all tests.

D. The GC must ensure the completion of the following prior to the start of FPTs: Certify through the SRC forms that the Security and Detention Control systems, equipment and assemblies have been installed, calibrated, started and are operating per the Contract Documents. Approval of the completed SRC forms by the CxA is required prior to conducting the FPTs.

E. Trade Sub-Contractors shall execute all FPTs per the approved test procedures on the FPT forms. The Trade Sub-Contractors shall document all testing results on the final FPT forms, signed and dated by the representative performing the test.

F. The CxC and Trade Sub-Contractors shall coordinate all FPT with the CxA, and provide a minimum of 10 day's notice prior to conducting each system test.

G. The GC and Trade Sub-Contractors must complete all FPTs for each system with signed approval by the CxA prior to formal approval of system commissioning.

H. The GC and Trade Sub-Contractors shall conduct FPTs using the following approved test methods:

1. Manually manipulating the equipment settings to observe performance.
2. Overwriting control system sensor values to simulate a condition.
3. Altering schedules to place the system into an after-hours state.
4. Using indirect indicators, such as readings from a control system screen reporting a door open, for testing responses will be allowed only after the actual conditions represented by the indirect indicators have been directly verified, calibrated and documented on the SRC forms (as a pre-functional check/test).
5. Monitoring performance by analyzing the control system Trend data. The CxA will analyze the control system Trend data.

I. Setup:

1. The Trade Sub-Contractor executing the test shall document the pre-test normal condition on the test form.
2. Each function and test shall be performed under conditions that simulate actual conditions as close as is practically possible.
3. The Trade Sub-Contractor executing the test shall provide all necessary materials, system modifications, etc. to produce the necessary flows, pressures, temperatures, etc. to execute the test according to the test procedures.
    a. The Trade Sub-Contractors shall provide any necessary control system global or system level commands and setpoint adjustments necessary to conduct the testing as called out in the FPT procedures. For example, globally adjusting the space temperature setpoints for all terminal units on a floor or AHU or the building. Or as another example, globally overriding the economizer status command for all AHUs.
4. At completion of the test, the Trade Sub-Contractor shall return all affected building equipment and systems to their pre-test normal condition.

3.03 FUNCTIONAL PERFORMANCE TESTS – TREND ANALYSIS

A. The CxA will prepare a Trend Analysis or Log Review plan with a points list and trend interval, as part of the FPTs in the Final Cx Plan, to verify integrated system operation and performance. The CxA will conduct trend analysis tests after completion of the Security and Detention control sequence FPTs and correction of all issues and deficiencies.

B. The Trade Contractor shall set up the trend log definitions prior to the start of the sequence of operation FPTs. The Trade Sub-Contractor shall provide the trend data to the CxA in an electronic format, either a text file, CSV file or Excel file, with related system parameters grouped together.

C. If the CxA discovers any performance issues during trend analysis, the Trade Sub-Contractor shall correct the issues and the CxA shall restart the trending.

3.04 COMMISSIONING ISSUES, BACK-CHECKS AND RE-TESTING

A. The GC and Trade Sub-Contractors shall document all deficiencies and issues on the appropriate forms in use, and the CxA will additionally document the issues on the Cx Issues List.

B. The CxA may allow immediate correction of minor deficiencies identified during testing. In such cases the Trade Sub-Contractor must still document the deficiency and identified resolution on the commissioning form in use.

C. When Cx Issues are identified during FPT, the CxA will discuss with the executing Trade Sub-Contractor and/or CxC and determine whether or not testing can proceed. The Cx Issue and any identified resolution will be documented on the test form in use in addition to the Cx Issues List.

D. The CxA will maintain and update the Cx Issues List, and document the issues resolution process. Copies will be distributed to the GC, Owner, and Trade Sub-Contractors as appropriate.

E. The GC/Trade Sub-Contractors shall promptly correct all deficiencies and Cx Issues. The responsible party shall correct the issue and inform the CxC and CxA of the resolution and completion date. The CxA will record completion on the Cx Issues List after successful back-check or verification and the CxC shall reschedule testing with the CxA and Trade Sub-Contractor. The Trade Sub-Contractor shall repeat testing until achievement of passing performance or Owner acceptance of the noted issue.

   1. Where sampling is used for witnessing PFCs and FPTs, the results shall be deemed acceptable once all noted issues are resolved and any new sample set of tests or checks have passed.

F. Additional parties may require input during a dispute regarding a Cx Issue. Regardless of the validity or responsibility of the issue, the CxA will have the final interpretive authority on Cx Issues and deficiencies and the Owner will have the final approval authority.

G. The CxA may recommend solutions to deficiencies and Cx Issues. However, the GC, Trade Sub-Contractors and the DPs ultimately have the burden of responsibility to solve, correct and perform required retests.

H. Additional Back-check Verifications and Re-testing:

   1. For all Cx Issues identified during the pre-functional system readiness activities, the CxA will back-check and verify the completion of the issues where appropriate.

   2. For all Cx Issues identified during FPT, the GC and Trade Sub-Contractors must complete retesting to verify the resolution of the issue and to complete the FPT.

   3. The CxA will witness one (1) re-test for each equipment and will perform one (1) back-check verification of any completed system readiness issue. The Owner may back-charge the GC for any additional fees from the CxA, resulting from any re-testing or repeated system readiness issues list back-checks beyond the first re-test or back-check.

   4. The CxC must provide a minimum 48 hour’s notice for scheduling any re-testing, though the CxA will attempt to accommodate a shorter timeframe if feasible.

   5. Any required retesting shall not be considered a justified reason for a claim of delay or for a time extension.

I. For any re-testing required, the CxA will determine if the entire test must be re-tested or if it is acceptable to re-test specific portions of the test that had failed.

3.05 O&M MANUAL AND TRAINING VERIFICATION

A. The GC and the CxC shall coordinate and schedule the training for Owner Personnel. The CxC shall ensure that training is completed per the requirements of the construction documents and specifications.

B. Trade Sub-Contractors responsible for specific equipment and system training shall submit to the CxC, a written training agenda for each training class for the equipment and systems to be commissioned, no less than 14 days prior to start of training. The GC shall submit the training agendas to CxA and Owner for review and approval. The training agendas shall cover the following elements:
   1. Equipment and/or systems included in training
   2. Intended audience
   3. Location of training
   4. Subjects covered (including a brief description and duration, presentation methods, etc.)
   5. Instructor's name and qualifications
   6. Copy of any handout materials or presentations.

C. The CxA will review the training plans to verify compliance with the specifications.

D. The GC shall submit to CxA 'attendee signed' attendance sheets for each training session conducted and a copy of the final training presentations.

E. The CxA will verify with the Owner that the GC has delivered the final O&M manuals per the Contract Documents. The CxA will review the draft O&M manuals for content and completeness and will verify with the Owner that the GC has delivered the final O&M manuals per the Contract Documents.

3.06 COMMISSIONING ACCEPTANCE, CLOSE-OUT AND REPORTING

A. See Section 019113, General Commissioning Requirements.

3.07 POST-OCCUPANCY WARRANTY PHASE COMMISSIONING

A. No later than 90 days prior to the expiration of the first 12 month warranty period of building occupancy, the CxA will return to the facility to interview facility staff (including security staff), walk the facility and review systems operation to identify any issues. Key representatives from the GC and Trade Sub-Contractors shall also attend, as determined by the CxA.

B. The CxA will also review security log trend data during the Post-Occupancy Warranty Phase. The Trade Contractor will be responsible for providing post-occupancy trend data to the CxA if required.

C. The CxA will report any performance issues, warranty items or problems to the CxC via a Warranty Phase Cx Issues List for correction by the GC and Trade Sub-Contractors prior to the end of the warranty period. The CxC shall work with the Trade Sub-Contractors and O&M staff to make corrections and modifications as required.

D. After correcting noted Warranty Phase Cx Issues, the GC shall notify the CxA in writing, and the CxA will back-check and verify resolution of the Warranty Phase Cx Issue.

E. Issues identified during the warranty period will remain Warranty Phase Cx Issues until satisfactory completion by GC and back-check verification by CxA, even if the warranty period expires during the correction and back-check period.

END OF SECTION

SECTION 28 13 00
ACCESS CONTROL AND ALARM MONITORING SYSTEM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Materials, equipment fabrication, installation, and tests in conformity with applicable Codes and authorities having jurisdiction for the following:

1. Provide new access control and intrusion alarm systems equipment and required communications system as shown on Drawings.
2. Provide all conduit, raceways, cables, backboxes, card readers, cards, controllers, printers, alarm contacts, glass break detectors, programming, software, licenses, and upgrades needed to achieve a complete and functional system. Also included are all required power supplies, power filtering, mounts, housings, equipment stands, and interfaces to required equipment.
3. System shall be configured to allow access with the presentation of a valid access card. A door contact shall indicate to the system that a door has been opened and closed and a Request to Exit device will indicate egress. The system shall be able to detect a forced or held door and indicate in several ways the open or closed condition of the door. The system shall record and store all events and transactions and provide a means to review an event log that has unlimited storage capacity.
4. Provide new proximity card readers.
5. Provide card reader controllers and other equipment as required.
6. Coordinate system requirements with the Owner's IT department.
7. Establish system communication with the Access Control System Server and panels via the Owner's LAN/WAN network.
8. Provide required interface relays, materials, and cabling to the fire alarm control panel.
9. Provide installation, testing, adjustment, and initial programming for all equipment.
10. Provide written documentation and instructions for system as installed.

B. Refer to Section 28 00 00 for Submittal, Substitution, and Warranty requirements.

1.02 RELATED SECTIONS

A. General: Consult all other Sections, determine the extent and character of related work, and properly coordinate work specified herein with that specified elsewhere to produce a complete and operable system.

B. Related Sections:

1. Section 28 00 00 Electronic Security and Safety
2. Section 28 23 00 Video Surveillance System

C. General and Supplementary Conditions: Drawings and general provisions of Contract and Division 1 of the Specifications, apply to Division 28 Sections.

PART 2 PRODUCTS

2.01 ACCESS CONTROL PRODUCTS

A. System Specifications

1. Manufacturer's catalog and system numbers of equipment listed in this specification indicate type, quality, and functions of the equipment required, and represent the minimum acceptable standards. Provide all compatible parts for the submitted system.
2. Access Control System shall comply with City standards. Acceptable manufacturers of related ACS equipment include, Lenel, Genetec, PDK, Software House or pre-approved equal.

B. Server Workstation
   1. Provide a rack-mounted system configured to meet the minimum requirements of the Access Control System manufacturer. System shall be, at a minimum:
      a. Intel core i7 processor
      b. 6.0 GB RAM
      c. 1TB Hard disk
      d. DVD-RW drive
      e. SVGA Graphics video adapter
      f. 19" rack-mounted SVGA LCD Display
      g. Keyboard and mouse
   2. Provide minimum 1 hour UPS backup for the server workstation.

C. Card Readers
   1. Card Readers shall be HID SEOS iCLASS SE R40, or HID SEOS iCLASS SE R15, and shall be manufactured by HID Corporation. The card readers shall meet or exceed the following criteria:
      a. The card reader shall read the encoded data from the access card and/or transponder and transmit the data back to the host panel, giving an audible and visual indication of a properly read card.
      b. Card readers shall be mounted @ +42” on center, above the finished floor (AFF). See drawings for specific mounting details.
      c. The card reader shall be listed under UL 294 as an access control system unit accessory, and shall have the following certifications: UL 294, and FCC.
      d. The card reader shall have separate terminal control points for the green LED, the red LED, and the audible indicator.
      e. The card reader shall have a hold line that will buffer a card read until the panel has asserted that the information can be sent up the line.
      f. The card reader shall have a card present line that will indicate that card data is ready to send for clock and data applications.
      g. The card reader shall have a re-present mode in which the card must be taken from the reader field for at least one second before being read again. This feature is required to prevent multiple reads from a single card presentation.
      h. The card reader shall be fully weatherized, and shall have an operating temperature of -22 to 150 degrees Fahrenheit (-30 to 65 degrees Celsius), and shall have an operating humidity of 5-95% non-condensing.
      i. The reader shall have a lifetime warranty.
      j. The card reader shall match the finish color of the wall/mounting surface to the best of its color selection.
      k. The card reader shall be wired and communicate in an OSDP protocol interface, and be compatible with all standard access control systems.
      l. The voltage requirements of the card reader shall be 5 to 16 VDC.

D. Wireless Card Readers
   1. Wireless card readers shall be Assa Abloy Aperio System as specified in Division 08.

E. Access Control Cards
   1. Cards shall be compatible with card readers. Provide a unique, "hot-stamp" serial number on each card, along with a printed list cross-referencing serial numbers, with internal

programming number. Cards shall be HID iCLASS SEOS + Prox smart cards. Coordinate with Owner and HID for specific card number sequencing.

2. Cards shall be printed with custom graphics and verbiage as directed by the Owner.
3. Furnish clips and chains for each card. Cards shall be able to be “punched” for a clip attachment after printing.
4. Furnish 300 cards to Owner’s representative. Coordinate Card Sequencing with the Owner

F. Access Control Panels

1. Access Control Panels shall be the standard product of a single manufacturer. The following requirements constitute the type, product quality, and operating features required; standard equipment manufactured by Software House, Lenel, and Genetec which meets the criteria described below is acceptable. All other systems must be pre-approved in writing.
2. Access Panel Controllers, I/O boards, and new power supplies for DC locks shall be provided with battery back-up sufficient to maintain full operation of monitoring functions for a minimum of 4 hours, plus a minimum of 25 lock activations in the event of power failure. Provide complete with input, outputs, and sufficient power for 8 reader-controlled doors.
3. Provide required interfacing relays between Access Control Panel (ACP) outputs and locks being controlled. Install diode noise suppression on all relay coils and lock coils.
4. Provide compatibility with Aperio locks used on this project.
5. Provide sufficient input boards to accept all monitored points and an additional 10% spare capacity on the Access Control System.
6. Provide sufficient output boards to accept all outputs and an additional 10% spare capacity on the Access Control System.
7. Provide reed tamper switches on each equipment cabinet.
8. Include input points to connect AC power fail and low battery conditions from power supplies to Access Control system.

G. Door Position Sensors

1. Provide GRI 190-12 or approved equal concealed contacts at doors where contacts are required, but not specified as part of door hardware.
2. Coordinate door contact installation to pre-drill door frames prior to frame installation to accommodate door contacts.
3. Where there are contacts on a set of double doors, provide a contact for each leaf and connect the doors as a single series circuit.
4. Contacts for roll-down doors shall be GE / Sentrol 2500 series, with mounting accessories as required.

H. Lock Power Supplies

1. Provide 24VDC power supplies for all electrically controlled door locks. Where power supplies are provided as part of the hardware group, coordinate the installation with Division 26 and connect power supplies to the ACMS system and local electric lock.
2. Size all power supplies to permit simultaneous continuous-duty activation of all door locks, with an additional minimum 30% capacity on each supply. Calculate voltage drop to locks and size lock control wiring to provide proper lock operation. Provide battery back-up sufficient for 25 activations for all DC locks.
3. Provide interfacing relays between Access Control Panel (ACP) and outputs and locks being controlled. Install noise suppression diodes on all locks as close as possible to the lock and at the control relay coil. Mount all interface relays and noise suppression devices within J-boxes and or power supply equipment enclosures.

4. Provide U.L. listed power supply with fire alarm system interface for automatic unlocking upon activation of building fire alarm. Coordinate and provide connection to building fire alarm system. Provide individual control of fail safe/fail secure operation of each lock relay based on lock requirements and fire input alarm signals to power supply.
5. Lock power supplies shall be Altronix AL600UL or approved equal.

I. Request-to-Exit (REX) Motion Sensors
1. Where REX is not provided as part of the door hardware, provide DSI model 160I REX motion detector with trim plate.

J. Desk Mounted Help Button
1. Provide desk mounted Help Button coordinated with furniture and casework at locations shown on drawings.
2. Mount with activation button at back of switch to avoid accidental activation.
3. Desk mounted help buttons shall require a key to reset. These buttons shall be Ademco model 269 or equal.

K. Remote Release Button
1. Provide desk mounted Remote Release Button coordinated with furniture and casework at locations shown on drawings.
2. Mount with activation button at back of switch to avoid accidental activation.
3. These buttons shall be HUB2SA or equal.

L. Glass Break Detector
1. Detector shall be Interlogic model 5812-RND or approved equal.

M. Doorbell System
1. Bell shall be ATW PC300 or approved equal.
2. Doorbell button shall be Viking DB40-WH or approved equal.
3. Power shall come from the power supply in the security closet.

N. Video Intercom System
1. Master station shall be Aiphone JP-4MED with desk stand or approved equal.
2. Sub-station shall be Aiphone JP-4HD with desk stand or approved equal.
3. Interior door stations shall be Aiphone JP-DA or approved equal.
4. Interior door stations shall be Aiphone JP-DVF or approved equal.

O. Resistor Packs
1. Provide resistor packs for all alarm initiating devices with the value as required by the system they are connected to. All devices shall have a normally closed circuit and alarm on open. Ensure 5 state zone monitoring of all points where permitted by the system they are connected to.

P. Labels
1. All labels for all cabling, power supplies, AC power cords and any connection to the security equipment shall be clearly labeled to identify the connected device or purpose. Labels shall be vinyl wrap with clear over lay so as not to become unraveled and shall not be made of plastic. Labels shall be placed as close to the wire termination point as possible and not placed on equipment that can be removed or replaced.
2. All labels for security equipment shall be clearly applied so as to easily identify the device or system served. Provide labels for all mounted and installed equipment including the exterior of enclosures, power supplies, UPS and other equipment. Labels shall be vinyl and not made of plastic.

Q. Tamper Switches

1. Provide magnetic tamper switches on all enclosures, power supplies and interface board junction boxes.
    a. Provide and install GE Sentrol 1285T surface mounted alarm contact for tamper switches on hinged security enclosure doors.
    b. Where multiple cans are provided for the same sub-system provide a series circuit between all tampers as a single input to the system.

2.02 WIRE AND CABLE

A. Wire and Cable Specifications

1. Follow the manufacturers' recommendation for cabling or the minimum requirements of the Specifications and Drawings, whichever provides for the most stringent requirements.
2. Wire and cable sizes, number of conductors, shielding, or other data listed in this Specification or shown on Drawings are a guide to the correct product required to achieve a working system and represent the minimum acceptable equipment.
3. Cables are to be shielded as necessary to preclude any outside noise or interference from entering the cable and degrading system performance. All cables shall be U.L. Listed, and appropriate for the application.
4. Use proper grounding practices to eliminate shorts, ground faults, ground loops, RF interference, voltage fluctuations, foreign voltages and open circuits.
5. Coordinate telephone line requirements and location for off-site monitoring. Provide RJ31X phone jacks for telephone system connections.
6. Cables run underground, under slab, or in slab shall be installed in conduit and rated for direct-burial application. Cables above hard ceiling or inaccessible areas shall be installed in conduit. Stub up conduits from within walls into accessible spaces.
7. All cables run in environmental air handling spaces shall be plenum rated. Provide proper J-hooks for cables not run in conduit. Cables not required to be in conduit shall be run along but not in Tel/Data cable trays.
8. All Cable shall be run in unbroken lengths of 1000 feet or less. No coaxial or power cables less than 1000 feet shall be spliced. When cable cannot be run in unbroken lengths due to cable spool limitations, splices shall be made in junction boxes with terminal blocks or terminal strips and fork spade lugs. All splices and junction boxes shall be clearly marked on the “As-Built” Record Drawings.
9. All wire-to-wire splices not utilizing terminal blocks or terminal strips shall be done with solder and electrical tape. Wires shall be individually soldered and taped, then neatly taped together to form the narrowest splice possible for ease of installation and removal, as well as overall protection of the splice. The use of all crimp type and screw type connectors i.e. beans, top hats, butt connectors, snap caps, wire nuts, and the “twist and tape” method are prohibited.
10. All End-of-Line supervision resistors shall be installed at the individual protection devices, and not in the control panels.
11. All 24VAC power cabling shall be of stranded construction. For connections requiring pressure captive connection, wire shall be solder tinned prior to insertion into pressure connectors.
12. Wiring shall be grouped and harnessed to facilitate access to all equipment, as well as maintenance and replacement of equipment.
13. All cable shall be labeled at origin and termination, referencing to a master legend schedule as shown on “As-Built” Record Drawings. Labeling and any splice locations shall be noted on “As-Built” Record Drawings. All labels shall be done using machine generated cable tags in the “flagged” position. Hand-written labels are not acceptable.

14. Cabling shall be sized and installed according to California Electric Code requirements.
15. Any cabling or raceway exposed to weather shall be rated for that use.
16. Stub up conduits from outlets into accessible spaces. Cables shall be run with but not in the Tel/Data cable tray. Mixing of security low voltage cables with Tel/Data cables will not be permitted. Utilize approved clips or mounting to securely mount security cable to the rack framework or hangers.
17. Cable not run with the cable tray shall be run along the wall using J-hook hangers. Hangers shall be sufficient to properly support cable.
18. Cabling shall be West Penn, Belden, Windy City Wire or approved equal.
19. All final labeling shall be with machine-generated printed labels, specifically made for cable labeling. No handwritten labels will be accepted. All wiring including power cords and feeds, network connections, and system cabling shall be fitted with a machine generated label identifying the device or point served. The id marker for each label shall have the device number and name.
20. Each enclosure shall have a security As-Built Drawing with point list and naming / numbering to match the machine generated labeling on cables terminated to the panels and power supplies.

2.03 INTRUSION ALARM SYSTEM

A. Intrusion alarm System shall comply with City standards. Acceptable manufacturers of related Intrusion alarm equipment include, DMP, Bosch, or pre-approved equal.

B. Provide Bosch D9512G Control Panel, Enclosure, power supply, auxiliary power battery back-up, and Bosch D1255 Command Center Keypad Arming Station at locations shown on the Drawings. No substitutions will be accepted.

C. Program the intrusion alarm panel to send alarm signals the designated monitoring company.

D. Perform all programming of the intrusion detection devices to ensure a complete and working system to the Owner's satisfaction. Coordinate with the Owner specific areas within the building to be armed. Coordinate with the Owner user access levels for the system and program a minimum of fifty users and pass codes for the initial startup of the system. System shall report all "Opening" and "Closing" reports by individual user.

E. Configure the door alarm contact on the card reader door next to the keypad as an entry exit zone on the intrusion detection system in order to allow preset timed access into and out of that area without causing an alarm on the intrusion detection system.

F. Install intrusion detection system in a locked enclosure with a tamper switch.

G. Security Contractor to supply and install D8004 transformer cover for the Bosch intrusion detection system D1640 transformer.

H. Coordinate the installation of network and telephone line connections inside the Bosch enclosure.

I. Provide and program telephone line supervision hardware and function.

J. Install the arming station keypads at locations shown on the Drawings.

K. Program an entrance delay of no more than 90 seconds.

L. Primary means of communication shall be via dial-up voice line to the offsite monitoring company. Secondary or backup communications shall be via network connection to the network location designated by the Owner. Coordinate telephone line and network connections and locations with the Owner and program accordingly. Contractor has responsibility for setting up the account with the offsite monitoring company in time to meet the construction schedule.

M. Provide coordination and programming to integrate the access control system with the Bosch intrusion detection system. The intrusion detection system will communicate alarms to the access control system via the Owner's LAN/WAN and report alarms to an Owner-supplied client workstation with Contractor installed client software at locations shown on the Drawings.

N. Provide Bosch B208 Eight Point Expanders for individual device input wiring.

O. Provide sufficient input points to monitor all field devices and ensure a minimum of 10 percent spare input points.

PART 3 EXECUTION

3.01 REQUIREMENTS

A. Refer to Section 28 00 00, for requirements regarding Record Drawings, Training, Tests and Reports, and Warranty.

B. Special coordination is required with the Owner regarding programming requirements. Contractor shall meet with the Owner's representatives and submit proposed labels for all input and output points for Owner review and comment. Software labels shall be consistent between various integrated systems, including Access Control and Video Surveillance System.

C. Programming for cardholders, time zones, and access levels as directed by the Owner.

D. Provide initial programming of 50 cardholders as part of system training. Train Owner on database importing from existing employee data base. Create database import tool specific to ACMS system and Owner's employee data field requirements.

E. Provide and install data interface including programming to Video Surveillance System equipment for event-based camera call-up as required by the Owner.

END OF SECTION

This page intentionally left blank

SECTION 28 15 00
INTEGRATED ACCESS CONTROL HARDWARE DEVICES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes access control door hardware for the following:
   1. Swinging doors.
   2. Other doors to the extent indicated.

B. Section includes, but is not necessarily limited to, the following for the integrated access control security and site management system:
   1. Electrified and Integrated Access Control Card Key Door Hardware

C. Related Sections include the following:
   1. Division 08 Section "Hollow Metal Doors and Frames."
   2. Division 08 Section "Flush Wood Doors".
   3. Division 08 Section "Aluminum-Framed Entrances and Storefronts".
   4. Division 08 Section "Door Hardware".
   5. Division 26 Section "Electrical" for connections to electrical power system and for low-voltage wiring work.
   6. Division 28 Section "Access Control" for access control devices and equipment installed at door openings and provided as part of a security and site management system.
   7. Division 28 Section "Intrusion Detection" for detection devices installed at door openings and provided as part of an intrusion detection system.
   8. Division 28 Section "Video Surveillance" for motion detection and video camera devices and equipment installed at door openings and provided as part of a security and site management system.
   9. Division 28 Section "Fire Detection and Alarm" for connections to building fire alarm system.

D. References:
   1. ANSI A117.1 (1998) - Accessible and Usable Buildings and Facilities.
   2. IBC - International Building Code
   3. NFPA 70 (2002) - National Electrical Code.
   4. NFPA 80 (1999) - Fire Doors and Windows.
   5. NFPA 101 (2006) - Life Safety Code.
   6. UL 294 - Access Control Systems.
   7. UL 1076 - Proprietary Burglar Alarm Units and Systems.

E. Products installed, but not provided under this Section include the following. Coordination to remain a requirement of this Section.
   1. Security or High Security keyed cylinders, including provisions for temporary construction keying, for mechanical override at access control locking hardware to be furnished under Division 8 Section "Door Hardware".

1.03 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. System Operational Descriptions: Complete system operational narratives for the integrated access controlled openings defining the owner's prescribed requirements for the opening functionality. Narratives include, but are not limited to, the following situations: normal

secured/unsecured state of door; authorized access; authorized egress; unauthorized access; unauthorized egress; fire alarm and loss of power conditions, and interfaces with other building control systems.

C. Shop Drawings: Details of electrified integrated locking hardware and access control firmware, indicating the following:
   1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication and control of the access control system electrified hardware and firmware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:
      a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
      b. Complete (risers, point-to-point) access control system block wiring diagrams.
   2. Electrical Coordination: Coordinate with related Electrical Sections the voltages and wiring details required at electrically controlled and operated hardware openings.

D. Proof of Certification: Upon request provide a copy of manufacturer(s) official certification or accreditation document indicating proof of status as a qualified and authorized provider of the primary access control components.

E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete access control and site management installation in quantity as required in Division 01, Closeout Submittals. The manual to include the name, address, and telephone number of the supplier/integrator providing the installation and the nearest service representatives for each item of equipment included in the system. The final copies delivered after completion of the installation test to include "as built" modifications made during installation, checkout, and acceptance.
   1. As-Built Drawings: During system installation, the Contractor to maintain a separate hard copy set of drawings, elevation diagrams, and wiring diagrams of the access control system to be used for record drawings. This set to be kept up to date by the Contractor with all changes and additions to the access control system accurately recorded.

F. Warranties and Maintenance: Special warranties and maintenance agreements specified in this Section.

1.04 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum of five (5) years of documented experience in providing access control and security systems equipment and software similar to that indicated for this Project and that have a proven record of successful in-service performance.
   1. Software and access control systems components to have been previously and thoroughly tested together with proven installations similar in size and functionality to the design requirements indicated for this Project.

B. Supplier Qualifications: Supplier/Dealers, verifiably authorized and in good standing with the primary product manufacturers, with a minimum of three (3) years of experience supplying integrated access control systems similar in material, design, and scope to that indicated for this Project and whose work has resulted in construction with a proven record of successful in-service performance.
   1. ASSA ABLOY access control products are required to be supplied only through designated “Authorized Channel Partners.”
      a. List Qualified ACP Companies

C. System Integrator Qualifications: Systems Integrators, verifiably factory trained and certified by the primary product manufacturers, with a minimum of three (3) years documented experience installing complete integrated access control systems similar in material, design, and scope to that indicated for this Project and whose work has resulted in construction with a proven record

of successful in-service performance. Qualifications include, but are not necessarily limited, to the following:

1. References: Provide a list of references for similar projects including contact name, phone number, name and type of project.
2. Professional Staffing: Firms to have a dedicated access control systems integration department with full time, experienced professionals on staff experienced in providing on site consulting services for both electrified door hardware and integrated access control systems installations.
3. Factory Training: Installation and service technicians are to be competent factory trained and certified personnel capable of maintaining the system.
4. Service Center: Firms to have a service center capable of providing training, in-stock parts, and emergency maintenance and repairs at the Project site with 24-hour/7-days a week maximum response time.

D. Installer Qualifications: Certified technicians, verifiably authorized with the primary product manufacturers for installation of IP-Enabled, Wireless, and Power-over-Ethernet Access Control products in accordance with documented instructions and NFPA 80.
   1. ASSA ABLOY access control products are required to be installed only through designated "Preferred Installers" with Intertek Qualified Hardware Installer certification.
   2. Installation technicians are authorized by Intertek to apply supplemental serialized labels to Warnock-Hersey fire-rated openings modified after access control hardware has been installed.

E. Source Limitations: Obtain the access control door hardware, system firmware and application software specified in this Section from a single source, qualified supplier/integrator unless otherwise indicated.
   1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
   2. Provide integrated access control door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

F. Regulatory Requirements: Comply with NFPA 70, NFPA 80, NFPA 101 and ANSI A117.1 requirements and guidelines as directed in the model building code including, but not limited to, the following:
   1. Comply with NFPA 70 "National Electrical Code", including electrical components, devices, and accessories listed and labeled as defined in Article 100 by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
   2. Where indicated to comply with accessibility requirements, comply with Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," ANSI A117.1.
   3. Comply with NFPA 101 "Life Safety Code" for doors in a means of egress.
   4. Comply with NFPA 80 "Fire Doors and Windows" for fire labeled opening assemblies.
   5. The installed access control system shall conform to all local jurisdiction requirements.

G. Keying Conference: Reference Division 8 Section "Door Hardware".

H. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier/Dealer, Systems Integrator, and Contractor to review proper methods and procedures for receiving, handling, and installing the access control system hardware. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedules.
   1. Inspect and discuss Division 26 electrical roughing-in and similar preparatory work performed by other trades.
   2. Review and verify sequence of operation descriptions for each unique access controlled opening.
   3. Review and finalize construction schedule and verify availability of materials.

4. Review the required inspecting, testing, commissioning, and demonstration procedures.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Do not store electronic access control hardware, software or related accessories at Project site without prior authorization.
   1. Access control firmware and software: Where approved and directed, inventory upon receipt and store electronic access control equipment in a secure, temperature and humidity controlled environment in original manufacturer's sealed containers.

B. Tag each item or package separately with identification related to the final Access Control Door Schedule, and include basic installation instructions with each item or package.

C. Deliver permanent keys, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner established at the “Pre-Submittal Conference".

1.06 COORDINATION

A. Coordinate quantity and arrangement of assemblies with ceiling space configuration and with components occupying ceiling space, including structural members, pipes, air-distribution components, raceways, cable trays, recessed lighting fixtures, and other items.

B. Access Control System Electrical Coordination: Coordinate the layout and installation of scheduled electrified door hardware, and related access control equipment, with required connections to source power junction boxes, power supplies, detection and monitoring hardware and fire alarm system.
   1. Door Hardware Interface: The card key access control system to interface and be connected to electronic door control hardware (electromechanical locks, electric strikes, magnetic locks, door position switches, other monitoring contacts, and related auxiliary control devices) as described under Division 8 "Door Hardware". Coordinate the installation and configuration of specified door hardware being monitored or controlled with the controls, software and access control hardware specified in this Section.

C. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing electrified door hardware and access control system components. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing access control system hardware to comply with indicated requirements.

D. Door and Frame Preparation: Related Division 08 Sections (Steel, Aluminum and Wood) doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.07 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article will not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and are in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of the installed access control system hardware and software that fails in materials or workmanship, including all related parts and labor, within specified warranty period after final testing and acceptance by the Owner. Failures include, but are not limited to, the following:
   1. Structural failures including excessive deflection, cracking, or breakage.
   2. Faulty operation of the hardware.
   3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
   4. Electrical component defects and failures within the systems operation.

C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.

D. Special Warranty Periods (Electrified Access Control Door Hardware):
   1. Two years for Electrified, Wiegand Output, and IP-Enabled Access Control Door Hardware.

E. Maintenance Support and Extended Service Agreement: Submit for Owner's consideration an optional extended Service Agreement for the installed access control system, including support for software related issues. The extended Service Agreement is considered elective and is without manufacturer's requirement stipulating mandatory coverage for owner and/or vendor system support.
   1. A published copy of this agreement to be included with the submittal package
   2. Support for the installed access control system components is provided through the vendor under a 24 hour technical assistance program.
   3. Access control and management system components are to be available on a one-day turn around time frame from the manufacturer.
   4. Primary systems manufacturer to offer and provide remote modem or internet access for direct factory support to the vendor. The factory level support to include diagnostics and troubleshooting support on systems related issues at no additional cost to the owner.

F. Access Control Software Upgrades: Version upgrades and "fix" releases to the access control system software are available at no extra charge as long as the version of software provided under this specification remains the current manufacturer's version or for up to (2) years after a new version release.
   1. Major access control software revisions that provide new functionality to the product provided free of charge for up to one (1) year from the date of substantial completion.
   2. Access control system software is to be upgradable as may be required or as necessary, to expand and manage the owner's site or sites. Upgrades are to be offered at a published flat fee for the primary system software, with single license modules included in the primary fee structure. System upgrades offered at a costing structure based upon the original number of licensed modules issued, or on those to be purchased at a future date, are not allowed.
   3. As part of the submittal package, provide a list of available software upgrades and/or expansions modules. List to identify related costs for upgrades, or expansions to the original system, up to the next qualifying operational level.

1.08 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of the installed access control system hardware and components.

B. Maintenance Service: Beginning at Substantial Completion, and running concurrent with the specified warranty period, provide continuous (6) months full maintenance by skilled employees of the Systems Integrator. Include repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door opening operation. Provide parts and supplies as used in the manufacture and installation of original products.

1.09 SCOPE OF WORK

A. On-Line Electronic Access Control System: Furnish and install at the indicated locations the specified electrified and integrated door hardware and access control firmware and software for a completely operational access control and security site management system. System includes, but is not necessarily limited, to the following:
   1. Electrified integrated card reader locks and exit hardware, permanent and temporary override cylinders, network control processors, reader controller panels, I/O monitor/control interfaces, door position switches, remote card readers, keypads, and display terminals, access cards and credentials, system application software, special

tools, operating manuals, and required cabling and accessories as detailed below and listed in the Access Control Hardware Sets at the end of Part 3.

a. Provide the appropriate number of reader controller panels and I/O monitoring/control expansion interfaces as needed to handle the number of card readers, locking devices, door status devices, and identified alarm inputs specified in this section, and as shown on the security drawings.
b. Provide manufacturer approved integrated card reader locks, exit hardware, and remote mounted card readers, keypads, and display terminals that are functionally compatible with the specified access control equipment interfaces.

2. Access control system equipment to be installed in an enclosure box compatible with the specified components. This enclosure to include, but is not necessarily limited to, the network control processor, I/O monitor/control interface panels, power supplies, terminal strips, wire ducts, keyed lock cylinder, integrated outlet for A/C power, and standoffs.
   a. Enclosure box to be located in the designated IT/Telecom room(s) with connection to local area network for communication back to the central server host.
3. Owner to provide the following:
   a. Central server host computer, client workstations, and hardware peripherals to be from an approved, major line computer manufacturer. Specific information detailing compliance with system requirements to be included in the project submittal package as specified.
   b. Owner will be responsible for ensuring that each computer hardware component includes the required interfaces, expansion boards, and peripherals that will be necessary to allow the system to operate as described within this specification and as indicated on the drawings.
   c. Power Sourcing and Network Switches: Quantity as required to accommodate installed access control (and video surveillance) devices.
   d. Network Control Processor Connections:
      1) LAN/Ethernet communication ports (jacks) and network interface cards as needed, CAT5e cabling from network router/switch to network control processor, outlet and cover plates and/or patch cables required for network connection within each designated IT/Telecom room.
      2) Required static IP addresses.
4. Power Supplies, including battery back up and separately fused surge protection, required for the electrified door hardware and access control equipment.
5. Installation, final configuration and commissioning of electrified door and access control system hardware, communication firmware, power supplies and related accessories.
6. System application software including installation, programming, and end user training of the access control system demonstrating operating, repair, and maintenance procedures. Include no fewer than 8 hours of on-site central server training for designated personnel (facilities maintenance, security, IT, administration) by a factory certified representative.
7. Provide manufacturer required power controllers, interface boards, and programming that may be required for approved electric latch retraction exit devices supplied under Division 08 Section "Door Hardware."
8. Electrical contractor, Division 26, to provide the following:
   a. Source power wiring (120VAC) as required for the electrified locking and access control hardware, equipment, accessories and power supplies. This includes quad outlets as required on a dedicated circuit in the designated IT/Telecom room(s) and the related conduit, stub-in, junction boxes and connectors required for the source power delivery and connections.
   b. Provide required conduit, stub-in, junction and back boxes for both the electrified locking hardware and access control equipment at each of the access controlled or monitored openings per plan drawings and specs. Supply and install conduit between each of the aforementioned devices and between the electrical junction boxes, power supplies and access control equipment located on or above the door opening.

1) At wall mounted remote readers, provide conduit on the secured side of the door, 36" from the finish floor and 6" from the edge of the frame, to the related power supplies and access control equipment.
2) At electrical hardware power transfers provide conduit on the secured side of the opening from the power transfer, thru-wire hinge, or serviceable panel location on the frame jamb to the related power supplies and access control equipment.

c. Electrical Contractor to provide all 120VAC cabling connections and terminations from the electrical junction boxes to these electrical devices.

9. Access Control System Integrator to provide the following:
   a. Low voltage wiring (12/24VDC) and communication cabling (RS-232/RS-485) from network control processors to reader controllers, I/O monitor/control interface panels, electrified and integrated locking hardware, remote card readers, keypads, or display terminals, monitoring and signaling switches, and power supplies. Work includes related connectors, final terminations, and hook-ups required for a complete and functional access controlled opening in accordance with applicable codes and specified system operational narratives.
10. Elevator Contractor to provide the following:
    a. Interface or landing of interface cable onto the elevator call button will be performed by a certified elevator contractor.
    b. Coordinate with access control systems integrator provisions for a card reader with output allowing the elevator call button to be activated. A validated card read will be required for activation.
11. Full and seamless integration of the site intrusion alarm service if applicable, with the installed site access control system software.
12. Final connections to fire alarm system, if required, by electrical and fire alarm system contractors.
13. Provide permits, submittals and approvals required by the authority having jurisdiction, prior to commencing with work.
14. Provide manufacturer required power controllers, interface boards, and programming that may be required for approved electric latch retraction exit devices supplied under Division 08 Section "Door Hardware."
15. Electrical contractor (Division 26) to provide the following:
    a. Provide required conduit, stub-in, junction and back boxes for both the electrified locking hardware and access control equipment at each of the access controlled or monitored openings per plan drawings and specs. Supply and install conduit between each of the aforementioned devices and between the electrical junction boxes, power supplies and access control equipment located on or above the door opening.
       1) At off-line remote readers, provide conduit on the secured side of the door, 36" from the finish floor and 6" from the edge of the frame, to the related power supplies and access control equipment.
       2) At electrified hardware power transfers provide conduit on the secured side of the opening from the power transfer, thru-wire hinge, or serviceable panel location on the frame jamb to the related power supplies and access control equipment.
    b. Electrical Contractor to provide all 120VAC cabling connections and terminations from the electrical junction boxes to these electrical devices.
16. Access Control System Supplier to provide the following:
    a. Low voltage wiring (12/24VDC) for the electrified locking hardware, remote card readers, monitoring and signaling switches, and power supplies. Work includes related connectors, final terminations and hook-ups required for a complete and functional access controlled opening in accordance with applicable codes and specified system operational narratives.
17. Typical System Requirements (Owner Provided): Central server host computer, client workstations, and hardware peripherals to be from an approved, major line computer

manufacturer. Specific information detailing compliance with system requirements to be included in the project submittal package as specified.

PART 1 PRODUCTS

2.01 WIRELESS ACCESS CONTROL

A. Wireless Access Control Mortise Locks: Wireless technology ANSI/BHMA A156.13 Grade 1 mortise lockset with integrated card reader, deadbolt monitoring, and request-to-exit and door position switch signaling in one complete unit. Motor driven locking/unlocking control of the lever handle trim, 3/4" stainless steel latch, and optional 1" deadbolt with hardened inserts. Lock is U.L listed and labeled for use on up to 3 hour fire rated openings. Available with or without keyed high security cylinder override.
   1. Wireless access control lock interface using local wireless connection between the lock unit and a nearby communication hub. Communication hub connected via RS-485 or Wiegand to a new or existing online electronic access control system platform.
   2. Fully-encrypted AES 128 wireless communication between lock and communication hub (IEEE 802.15.4, 2.4 GHz) with no proprietary programming device requirements. Locks will continue functional operation independent of wireless connection slowdown or failure.
   3. Integrated card reader supports 125kHz proximity credentials; 13.56 MHz contactless credentials: HID® iCLASS (full authentication, all formats, including SEOS), Mifare Classic (Sector and UID), DESFire, NFC-enabled mobile phones.
   4. Support for HID Mobile Access via Bluetooth Low Energy (BLE) short-range wireless communication.
   5. Lockdown capability with maximum 10 second response.
   6. Patent pending credential cache to ensure offline access.
   7. Power Source: 6 AA alkaline batteries power supply with LED indication of locked, programming mode and low capacity warning status conditions.
   8. Energy Efficient Design: Provide lock bodies which have a holding current draw of 15mA maximum, and can operate on either 12 or 24 volts. Locks are to be field configurable for fail safe or fail secure operation.
   9. Outside lever rigid except when valid user code is entered. Emergency override access capability with optional mechanical key cylinder retraction of lock latch bolt without necessary electronic activation.
   10. Communication Hub: Provide the necessary number of hubs which is connected to the access control system via RS-485 or Wiegand as required by the system. Provide hubs factory paired with the locks, but allow for field configuration as needed.
   11. Complete installation to include manufacturer's Installation Tool and USB Radio Dongle for initial lock set-up and configuration. Electronic on-line access control system platform, including communication cabling and software, by others.
   12. Manufacturers:
      1) Sargent Manufacturing (SA) – IN100 – 7900 Series.
      2) Substitutions: See Section01 60 00-Product Requirements.

B. Wireless Access Control Cylindrical Locks: Wireless technology ANSI/BHMA A156.2 Series 4000 Grade 1 cylindrical lockset with integrated card reader and request-to-exit signaling in one complete unit. Separate DPS connects directly to lock electronics for door position (open/closed status) monitoring. Motor driven locking/unlocking control of the lever handle trim with 1/2" deadlocking stainless steel latch. Lock is U.L listed and labeled for use on up to 3 hour fire rated openings.
   1. Wireless access control cylindrical locks interface using local wireless connection between the lock unit and a nearby communication hub. Communication hub connected via RS-485 or Wiegand to a new or existing online electronic access control system platform.
   2. Fully-encrypted AES 128 wireless communication between lock and communication hub (IEEE 802.15.4, 2.4 GHz) with no proprietary programming device requirements. Locks will continue functional operation independent of wireless connection slowdown or failure.

3. Integrated reader supports HID® 125kHz proximity credentials; or ISO 14443 A/B and ISO 15693 13.56 MHz contactless credentials: HID® iCLASS/iCLASS SE (full authentication, all formats), MIFARE Classic, DESFire EV1 (full authentication, all formats); or Near Field Communications (NFC); or HID® SIO enabled.
4. Support for HID Mobile Access via Bluetooth Low Energy (BLE) short-range wireless communication.
5. Power Source: 6 AA alkaline batteries power supply with LED indication of locked, programming mode and low capacity warning status conditions.
6. Outside lever rigid except when valid user code is entered. Emergency override access capability with optional mechanical key cylinder retraction of lock latch bolt without necessary electronic activation.
7. Communication Hub: Provide the necessary number of hubs which is connected to the access control system via RS-485 or Wiegand as required by the system. Provide hubs factory paired with the locks, but allow for field configuration as needed.
8. Complete installation to include manufacturer's Installation Tool and USB Radio Dongle for initial lock set-up and configuration. Electronic on-line access control system platform, including communication cabling and software, by others.
9. Manufacturers:
    1) Sargent Manufacturing (SA) – IN100 10 Line Series.
    2) Substitutions: See Section01 60 00-Product Requirements.

C. Wireless Access Control Exit Hardware: Wireless technology ANSI/BHMA A156.3 Grade 1 rim and mortise exit device hardware with integrated card reader. Separate DPS connects directly to exit hardware electronics for door position (open/closed status) monitoring. Motor driven locking/unlocking control of the lever handle exit trim with 3/4" throw latch bolt. U.L listed and labeled for either panic or "fire exit hardware" for use on up to 3 hour fire rated openings. Available with or without keyed high security cylinder override trim.
1. Wireless access control exit hardware interfaces using local wireless connection between the electronic exit trim and a communication hub located directly above the door. Communication hub connected via RS-485 to a new or existing online electronic access control system platform.
2. Fully-encrypted AES 128 wireless communication between lock and communication hub (IEEE 802.15.4, 2.4 GHz) with no proprietary programming device requirements. Locks will continue functional operation independent of wireless connection slowdown or failure.
3. Integrated card reader supports 125kHz proximity credentials; 13.56 MHz contactless credentials: HID® iCLASS (full authentication, all formats, including SEOS), Mifare Classic (Sector and UID), DESFire, NFC-enabled mobile phones.
4. Support for HID Mobile Access via Bluetooth Low Energy (BLE) short-range wireless communication.
5. Lockdown capability with maximum 10 second response.
6. Patent pending credential cache to ensure offline access.
7. Power Source: 6 AA alkaline batteries power supply with LED indication of locked, programming mode and low capacity warning status conditions.
8. Outside lever rigid except when in "passage" mode, or valid user code is entered. Emergency override access capability with optional mechanical key cylinder retraction of exit device latch without necessary electronic activation.
9. Complete installation to include manufacturer's Installation Tool and USB Radio Dongle for initial lock set-up and configuration. Electronic on-line access control system platform, including communication cabling and software, by others.
10. Manufacturers:
    a. Sargent Manufacturing (SA) - IN100 – 80 Series.
    b. Substitutions: See Section01 60 00-Product Requirements.

2.02 CABLES AND WIRING

A. Comply with Division 27 Section "Conductors and Cables for Electronic Safety and Security."

B. Data Line Supervision: System to include alarm initiation capability in response to opening, closing, shorting, or grounding of data transmission lines.

C. Install appropriate number of conductor pairs, in the wire gage (AWG) recommended by manufacturer, corresponding to the electronic locking functions specified, amperage drawn and distances covered between the power supplies, power transfer devices, electrified hardware and access control equipment.

2.03 ACCESS CONTROL HARDWARE FINISHES

A. Standard: Comply with BHMA A156.18.

B. Protect mechanical finishes on exposed surfaces from damage by applying temporary protective coverings before shipping.

C. Where specified, finishes on integrated card key locksets or exit hardware to incorporate an FDA recognized antimicrobial coating (i.e., MicroShield™) listed for use on equipment as a suppressant to the growth and spread of a broad range of bacteria, algae, fungus, mold and mildew.

D. BHMA Designations: Comply with base material and finish as specified.

PART 1 EXECUTION

3.01 EXAMINATION

A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance of the installed access control system.

B. Examine roughing-in for electrical source power to verify actual locations of wiring connections before electrified and integrated access control door hardware installation.

C. Examine roughing-in for LAN and control cable conduit systems to PCs, controllers, card readers, and other cable-connected devices to verify actual locations of conduit and back boxes before device installation.

D. Notify architect of any discrepancies or conflicts between the specifications, drawings and scheduled access controlled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.02 PREPARATION

A. Doors and frames at scheduled access controlled openings to be properly prepared to receive specified electrified and access control hardware and connections without additional in-field modifications.

3.03 INSTALLATION

A. Install each item of electronic integrated door hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

B. Mounting Heights: Mount electronic integrated door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
   1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
   2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
   3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."

C. Boxed Power Supplies: Verify locations.

1. Configuration: Provide the least number of power supplies required to adequately serve doors with access control hardware and equipment.

D. Final connect the system control switches (integrated card key locking hardware, remote readers, keypads, display terminals, biometrics), and monitoring, and signaling equipment to the related Controller devices at each opening to properly operate the electrified door and access control hardware according to system operational narratives.

E. Retrofitting: Install each door hardware and access control item to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

F. System Application Software: Install, and test application(s) software and databases for the complete and proper operation of systems involved. Assign software license(s) to Owner.

3.04 FIELD QUALITY CONTROL

A. Field Inspection (Punch Report): Reference Division 01 Sections “Closeout Procedures”. Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.
   1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.
   2. Submit documentation of incomplete items in the following formats:
      a. PDF electronic file.
      b. Electronic formatted file integrated with the Openings Studio™ door opening management software platform.

B. Commissioning and Testing Schedule: Prior to final acceptance of the access control system installation, the following testing and documentation to be performed and provided to the Owner.
   1. Inspection: Verify that units and controls are properly installed, connected, and labeled and that interconnecting wires and terminals are identified.
   2. Pre-testing: Program and adjust the system and pretest all components, wiring, and functions to verify they conform to specified requirements. Provide testing reports indicating devices tested, pass/fail status, and actions taken to resolve problem(s) on failed tests.
   3. Acceptance Test Schedule: Correct deficiencies identified by tests and observations and retest until specified requirements are met.
   4. Provide “as designed” drawings showing each device and wiring connection and electronic enclosure legends indicating cabling in and out.
   5. Provide a complete set of operating instructions for access control hardware devices and a complete software user manual. The documentation includes module reference guides for each electronic enclosure.

3.05 ADJUSTING

A. Adjust and check each operating item of integrated access control door hardware, and each door opening to ensure proper secured operation and function of every unit. Replace units that cannot be adjusted to operate as intended.

3.06 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by access control system installation.

B. Clean operating items as necessary to restore proper finish and provide final protection and maintain conditions that ensure access control door hardware is without damage or deterioration at time of owner occupancy.

3.07 DEMONSTRATION

A. Engage an authorized systems manufacturer representative to train Owner's maintenance personnel to adjust, operate, and maintain electronic integrated door hardware and the access control system.

3.08 ACCESS CONTROL HARDWARE SETS

A. The access control system hardware sets listed below represent the design intent and direction of the owner, architect, and security consultant (as applicable). They are intended as a guideline only and should not be considered a detailed opening schedule. Discrepancies, conflicting, and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

B. The supplier is responsible for handing and sizing all products and providing the correct option for the appropriate door type and material where more than one is presented in the hardware sets. Quantities listed are for each pair of doors, or for each single door.

C. Refer to Section 087100, Door Hardware, for hardware sets.

END OF SECTION 28 15 00

SECTION 28 23 00
VIDEO SURVEILLANCE SYSTEM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Materials, equipment fabrication, installation, and tests in conformity with applicable Codes and authorities having jurisdiction for the following:

1. Materials, equipment fabrication, installation, and tests in conformity with applicable Codes and authorities having jurisdiction for the following:
2. Provide Network-based Video Surveillance System as shown on Drawings.
3. Provide all cables, fiber, backboxes, POE/IP color cameras, enclosures, cabling, and programming needed to achieve a complete and functional system. Provide all required power supplies, power filtering, mounts, housings, and interfaces to equipment furnished by others.
4. Connect camera cabling to Owner-provided PoE network switches in Telecommunications Rooms.
5. Provide installation, testing, adjustment, and all necessary system programming for all equipment.
6. Provide written documentation and instructions for system as installed.
7. Provide training to the Owner in the operation, adjustment, servicing, and repair of this system.

B. Refer to Division 1 and Section 28 00 00 for Submittal, Substitution, and Guarantee requirements.

1.02 RELATED SECTIONS

A. General: Consult all other Sections, determine the extent and character of related work, and properly coordinate work specified herein with that specified elsewhere to produce a complete and operable system.

B. Related Sections:

1. Section 28 00 00 Electronic Security and Safety
2. Section 28 13 00 Access Control System

PART 2 PRODUCTS

2.01 VIDEO SURVEILLANCE SYSTEM

A. System Specifications

1. Manufacturer’s catalog and system numbers of equipment listed in this specification indicate type, quality, and functions of the equipment required, and represent the minimum acceptable standards. Equipment shall be manufactured by DW Spectrum, Exacq vision, AXIS, Bosch, Sony, or pre-approved equal.

B. Fiber, Wire, and Cable

1. Follow the manufacturers’ recommendation for cabling. Wire and cable sizes, number of conductors, shielding, or other data listed in this specification or shown on Drawings are a guide to the correct product required to achieve a working system and represent minimum acceptable equipment.
2. Wiring shall be grouped and harnessed to facilitate access to all equipment, as well as maintenance and replacement of equipment.
3. Terminate camera wiring on Owner-provided POE switches in IDF Rooms and Data Closets. Coordinate all cable infrastructure from the switch to servers and clients with the requirements of Division 27.

4. Label all cable at origin and termination, referencing to a master legend schedule shown on submittal drawings. Note labeling on submittal drawings and Record Drawings.
5. Size and install cabling according to National Electric Code requirements and meet industry standards for CAT-6 data infrastructure.
6. Shield cables as necessary and as shown on Drawings to preclude any outside noise or interference from entering the cable and degrading system performance.
7. All cabling or raceway exposed to weather shall be NEC rated for its application.

C. Network Video Recorder (NVR)

1. Provide Network Video Recorders to record all cameras in the Project. NVR shall be installed in the SEB Building 4th Floor Data Center. Coordinate installation in existing racks. NVR'S shall be by ExacqVision or approved equal.
   a. Provide "watchdog protection" or reboot script files on all Network Video Recorders. The recorders must automatically reboot to a user-defined recording mode upon any system lockup or power failure reset.
   b. Coordinate with the Owner which alarms are to be programmed for camera call-up, what features are to be programmed during an alarm, and their priority level.
   c. Provide all programming and installation to fully integrate the Network Video Recorders with the Access Control System. Events occurring at any access control system devices shall initiate alarm-based recording of the nearest camera for a period of fifteen seconds prior to the event occurance and one minute after the event occurance.
   d. Configure the Video Surveillance system for remote video viewing, administrative functions, and recall of stored video from a licensed client via the Owner's LAN/WAN.
   e. Configure the cameras for motion based recording.
   f. Provide additional equipment including rack-mount kits, and network patch cables as required. Use 1000Base-TX-compliant connectors for all networking connections.
   g. The video system shall allow remote viewing for both real time monitoring and recorded video retrieval from locations as defined on the Owner's LAN/ WAN through a thick client.
   h. Provide simultaneous video viewing licenses for all workstation locations noted on the drawings, plus an additional two licenses.
   i. Provide mass storage for digital imaging that is scalable via Network Attached Storage (NAS) or Storage Area Network (SAN).
   j. Provide a rack-mount, hot swappable, RAID-6 configured storage server with capacity to record each installed camera at 1920x1080 resolution, 15IPS for 365 days. Provide an additional storage capacity to accommodate the installation of 8 future cameras. Calculate storage requirements using H.265 video compression standard.
   k. Video equipment shall allow camera recording framerate, resolution, and duration to be configured on a per-camera basis.
   l. Camera viewing and manipulation; the video system shall allow for programming of camera selection for viewing, scanning, P/T/Z movement, and instant record selection by camera. Both "Real-time" viewing and archived viewing will be supported through the client workstations and or web browser interface.
   m. Program Video Surveillance System as specified above and as directed by Owner's representative.

D. Cameras

1. Provide POE/IP color fixed cameras with integrated lens at locations shown on the Drawings.
    a. Outdoor fixed cameras shall be AXIS P3364VE or approved equal.
    b. Indoor / Outdoor 180 degree cameras shall be AXIS Q3708 or approved equal.
    c. Indoor / Outdoor 360 degree cameras shall be AXIS P3717 or approved equal.
    d. Indoor fixed cameras shall be AXIS P3245V or approved equal.
    e. Camera mounts and housings shall be as shown on the details found on the Drawings. Provide proper backing at all locations
    f. Secure all cameras and housings as appropriate to structural requirements and construction conditions. Utilize tamperproof-mounting hardware.
    g. Camera housings installed in ceilings shall have attachments to building structure independent of ceiling, fire sprinkler, conduit, or other system supports.
    h. Cameras installed at outdoor locations shall have proper weather proofing with fans and heaters (where required).
2. Replace or adjust lenses at no cost to Owner if necessary, to obtain proper field of view.
3. Provide varifocal lengths with auto iris lenses where required.
4. Provide color corrected lens with glass optics.
5. Coordinate the installation of cameras with the Owner for desired views.
6. Program camera recording stream for 1080p, 15fps. Confirm camera stream configuration with Owner.

PART 3 EXECUTION

3.01 REQUIREMENTS

A. Refer to Section 28 00 00, for requirements regarding As-Built Drawings, Training, Tests and Reports, and Warranty.

B. Provide one indoor fixed camera and one outdoor fixed camera as spare parts.

END OF SECTION

SECTION 28 31 00
FIRE DETECTION AND ALARM

PART 1 GENERAL

1.01 SUMMARY

A. This section describes requirements for manual and automatic fire alarm systems.

B. The system as specified shall be supplied, install, tested and approved by the local Authority Having Jurisdiction, and turned over to the owner in an operation condition.

C. Submit fire alarm system plans to city for approval in accordance with city guidelines and regulations and reference in the specification.

D. The fire alarm drawing are to be provided by the contractor and require outside engineering & separate submittals to the building Department for review & permitting. Submit items to the architect for Review & approval prior to city review, per City of Stockton municipal Code chapter 7.28, section 7.2B.310(c).

E. Contractor is responsible for applying, submitting and paying for design/permits for the fire alarm system.

1.02 DESCRIPTION

A. Work includes:
   1. Furnish all labor, fire protection engineering, design, materials, tools, equipment and services for fire detection and alarm system consisting of addressable initiating and signaling devices, conduit, boxes, wiring, annunciator panels, and other components necessary for proper operation, testing and control of a complete and demonstrable operable system.
   2. Although such work is not specifically indicated, furnish and install all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure, and complete installation. Any omission in specified equipment will not relieve the Contractor of the responsibility for furnishing and installing a fully operational and approved system.
   3. Provide all electrical connections needed for fire alarm equipment. The term "electrical connections" includes all operations and materials associated with completing electrical connection starting with pulled in wire including, but is not limited to:
      a. Stripping of jacket(s) and insulation.
      b. Checking for continuity.
      c. Meggering.
      d. Tracing of wire.
      e. Fanning.
      f. Measuring and cutting to final termination lengths.
      g. Installing wire and permanent wire markers for identification of conductors.
      h. Installation of lugs, connectors or terminals.
      i. Fastening wire to designated terminal point or other designated point.
      j. Taping.

B. Description of system: Automatic and manual, addressable, analog, general alarm, supervised, 24-volt DC fire detection and alarm system.
   1. Provide non-coded positive non-interfering system.

C. Provide components including but not limited to following.
   1. Fire alarm control panel.
   2. Remote annunciator.
   3. General alarm addressable manual stations.
   4. Automatic addressable heat detectors with provisions for future analog output devices.
   5. Automatic addressable smoke detectors with provisions for future analog output devices.

6. Automatic addressable duct detectors with provisions for future analog output devices.
7. Remote alarm indicator with test/reset switch for concealed smoke detectors/duct detectors.
8. Sprinkler and standpipe flow switch and main water-flow detector circuits.
9. Main, post indicator valve and O, S & Y sprinkler valve tamper switch circuits.
10. Separate power supply with battery backup and circuiting to fire alarm activated door closers (24V).
11. Modules for interfacing contact closure devices to addressable system. Do not use interface modules to connect non-addressable manual stations to fire alarm system.
12. Flashing general alarm lights (Strobe).
13. Combination audible and visual signal devices.
14. Fire alarm system conduit and wire.

1.03 FIRE ALARM SYSTEM: SCOPE

A. General:
   1. Deferred Approval: Provide new fire detection and alarm design for Buildings 1 and 2.

B. Scope of Work:
   1. Prepare complete shop drawings and obtain Engineer’s approval prior to Contractor’s deferred approval submission.
   2. Submit fire alarm system plans to city for approval in accordance with city guidelines and regulations and reference in the specification.
   3. Pay all permit fees associated with the fire alarm system installation, testing and acceptance.
   4. Furnish, install, connect and test new fire alarm system.
   5. Test and demonstrate operation of the fire alarm control panel with initiating and signal appliance devices installed and connected.
   6. Post permanent signage on door(s) leading to the fire alarm control panel stating the following: FIRE ALARM PANEL. Letters shall be no less than 3 inches tall, white in color on red background. In addition, provide similar signage on all doors leading to remote power supplies or other fire alarm control equipment.

C. Fire Protection/Automatic Sprinkler System: Main sprinkler water-flow detector and sprinkler flow alarm switches.

D. Fire Protection/Automatic Sprinkler System: Main sprinkler water valve, post indicator valve and O, S and Y valve tamper switches.

1.04 RELATED SECTIONS

A. Section 26 01 00: General Requirements for Electrical Work.

1.05 QUALITY ASSURANCE

A. System standards:
   1. National Fire Protection Association (NFPA) 72, 2019 Edition
   2. National Fire Protection Association 90A.
   3. California Electrical Code (CEC) 2019 edition, Article 760.
   4. California Building Code (CBC), 2019 edition Title 24 Parts 2,3,7,9, & 12.
   5. Factory Mutual (FM) approved.
   6. Approved by California State Fire Marshal (CSFM) and Title 19.
   7. TITLE 24 Parts 2, 3, 7, 9, & 12.
   8. National Electrical Manufacturer's Association (NEMA) 72 Protective Signaling Systems.
   9. NEMA SB-27 Signaling Apparatus.
   10. NEMA SB-9 Smoke Detectors
   11. NEMA ICS 1 Industrial Controls and Systems.
   12. NEMA ICS 4 terminal Blocks for Industrial Control Equipment and Systems.
   13. NEMA ICS 6 enclosure for Industrial Control and Systems.
   14. Other codes as required.

B. Design criteria:
   1. Comply with all system standards.
   2. Meet all requirements of fire authorities having jurisdiction.
   3. Complete fire detection and alarm system design, wiring diagrams, interface wiring diagrams, and operational details by system manufacturer or authorized technical representative.
   4. System: All equipment shall be approved and listed by the CSFM and Underwriters Laboratories, Inc. (UL).
   5. Installation shall conform to the CSFM requirements and shall be subject to inspection by them.
   6. Provide audible and visual notification appliances throughout per NFPA 72. Provide visual notification in Public and Common areas per CFC 907.
   7. Provide manual pull stations per NFPA 72.
   8. Provide sprinkler fire protection monitoring per NFPA 72. Scope includes relocating existing Fire Department Connection and PIV monitoring per plans to the existing FA system.
   9. Provide smoke detection at all code required locations (FACP, Duct Detectors, Elevators, etc) and at selected locations shown on plan. Duct detectors provide by Mechanical shall be monitored.
   10. Provide required shut downs and alarms per code.
   11. Provide alarming to the existing fire alarm system supervising station.
   12. The FA System devices shall meet ADA requirements
   13. Strobes shall be synchronized per code.

C. Contractor qualifications:
   1. Offer an annual maintenance contract including complete service and equipment costs for maintenance of complete system.
   2. Show evidence upon request of five years experience minimum servicing fire alarm systems.
   3. Show evidence upon request of five years experience minimum installing systems of similar type and scope.
   4. Provide for 24 hour emergency service.
   5. Factory trained technicians.

1.06 SUBMITTALS

A. Submit the following with shop drawings:
   1. Floor plans showing the entire area, all fire rated walls, the addresses for all addressable devices and the routing of conduit and wire. Indicate on all conduit runs, the conduit size and type and size of wires.
   2. Single line riser diagram showing all fire alarm system circuits.
   3. Point to point diagram.
   4. Wiring diagrams that indicate internal wiring for each item of equipment and the interconnections between the items of equipment.
   5. Technical data showing exact types and quantity of all fire alarm system components. High-light or otherwise identify specific components on catalog cut sheets. All equipment drawing alarm or supervisory current shall have documentation of the current draw highlighted in the submittal information.
   6. CSFM listing sheet with current expiration date for each component.
   7. Battery capacity calculations. Submit complete battery calculation sheet showing all the electrical requirements for the entire fire alarm system, including the power consumption to the individual devices, both in alarm and supervisory modes on 8-1/2 x 11 inch paper.
   8. Voltage drop calculations for all wire and cable runs.
   9. Equipment list to show all fire alarm system components, the symbols used, the quantities, manufacturers' model number and CSFM listing numbers.

10. Provide sequence of operations to show how the system will react to the activation of each type of device.
11. List of wire and cable that specifies gauge and type of wire to be used.
12. Details and listing number of through penetration fire stop system.
13. All fire alarm panel programming information.
14. Details for mounting of equipment.
15. Stamp and signature of design professional of record.
16. Include the following statements on shop drawings:
    a. Provide fire alarm system that conforms to Article 760 of the CEC.
    b. Do not start installation of the fire alarm system until details, plans and specifications, CSFM Listing Sheets, including listing number with annual update and expiration date, for all system components have been approved by the CSFM.
    c. Keep a stamped set of approved fire alarm shop drawings on the job site and use for installation. Obtain approval for all deviations from approved shop drawings, including substitution of devices, from the CSFM.
    d. Upon completion of the installation of the fire alarm system, perform two separate tests. In both tests, successfully demonstrate all functions required in the contract. Complete one test in the presence of the Owner's representative and conduct a separate test for final acceptance by the CSFM in the presence of the Owner's representative.
    e. Bring all discrepancies between the drawings and the codes or recognized standards to the attention of the Owner.
    f. Provide a minimum of 48 hours notice to the Owner's representative for all inspection and/or testing.

B. Submittals will be automatically rejected if complete listing information does not accompany submittal.

C. Submit proof of qualification required by section 1.05 C above, “Contractor’s Qualifications”.

1.07 OPERATION AND MAINTENANCE MANUAL

A. Provide a minimum of 6 copies of the Operations and Maintenance Manual. Label and neatly install the manuals in a binder with tabs and sections as indicated in a Table of Contents. Neatly fold large drawings and blueprints. Include manufacturers’ data sheets, maintenance and operation information sheets, copies of all programming sheets with the final room numbers included, as built drawings showing the final room numbers, and any other information on operation or maintenance.

B. Submit 2 copies of complete as-built installation wiring documentation, internal fire alarm control panel schematics, and maintenance manuals prior to final acceptance.

1.08 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Provide material that is new, in condition acceptable to Owner's representative and suitable for intended use.

B. Deliver materials in the original, unopened and labeled packages.

C. Handle and store materials to protect from damage.

D. Deliver spare parts to the Owner's representative. Obtain a receipt as proof of delivery of spare parts specified in this Section.

1.09 SITE EXAMINATION AND CONDITIONS

A. Refer to Section 26 01 00 - General Requirements for Electrical Work, Article 1.14: Coordination with other trades.

B. Accept information shown on the drawings based upon available records and data as approximate only. Make minor deviations found necessary to conform to actual locations and conditions with no increase in contract sum.

PART 2 PRODUCTS

2.01 FIRE ALARM SYSTEM

A. Acceptable manufacturer:
   1. Manufacturer must have local service organization.

B. All equipment:
   1. UL listed as a product of a single manufacturer under appropriate category.
   2. Equipment shall not be modified or installed to alter or void UL label or listing.
   3. CSFM listed.
   4. Equipment and material damaged during transportation, installation, or operation will be considered as totally damaged. Replace with new. Variance from this will be permitted only with written approval from the Owner's Representative.
   5. Miscellaneous Accessories: Channels, joiners, hangers, caps, nuts and bolts, and associated parts shall be plated electrolytically with zinc, followed immediately thereafter by treating the freshly deposited zinc surfaces with chromic acid to obtain a surface which will not form a white deposit on surface for an average of 120 hours when subject to a standard salt spray cabinet test or accessories shall be hot-dipped galvanized.

2.02 FIRE ALARM SYSTEM OPERATION: ALARM

A. Activation of any signal initiating devices shall cause the following:
   1. Fire alarm control panel to enter alarm mode.
   2. Transmit the alarm signal to remote alarm station.
   3. Operate alarm horn/strobes.
   4. Annunciate the alarm at the remote annunciation.
   5. Shut down fans in the affected and adjoining zones as described in the specifications/plans for this project.

B. Area smoke detector alarm shall also cause the following:
   1. Fire alarm control panel to enter supervisory mode.
   2. Transmit a supervisory signal to the remote alarm station.
   3. Release fire/smoke damper control for duct in which duct detector is in alarm.

C. Configure horn/strobes and strobes to operate in a synchronized fashion and to be silenced at fire alarm control panel. Provide capability to silence horns of horn/strobe combinations allowing strobe to continue in alarm mode.

2.03 ALARM SIGNALLING APPLIANCES

A. General: Provide the number and location of audible devices necessary to meet the audibility requirements of the codes and standards. Furnish and install additional devices where required and perform tests to show that audible devices meet these requirements.

2.04 FIRE ALARM WIRE AND CABLE

A. Conductors:
   1. Wires shall be stranded copper conductors, except for underground work, THWN insulated. Unless otherwise indicated on plan, minimum size shall be as follow:
      a. 120V AC and power supply connections: 12GA, minimum.
      b. Low-voltage general alarm circuits: 14GA, minimum.
      c. Low-voltage signal initiating circuits: 18GA, minimum.
      d. Annunciator and data communication circuits as required by manufacturer; UL listed.
      e. Use larger wire sizes when recommended by equipment manufacturer and to allow for future expansion.
      f. Systems which recommend shielded wire shall use such wire.

PART 3 EXECUTION

3.01 INSTALLATION

A. General
   1. Install all components as shown on approved drawings and in accordance with all codes, and manufacturers' diagrams. If the drawings contradict codes or manufacturers' data sheets, immediately contact the Architect to clarify and correct the problem.
   2. Install all components as indicated and in accord with manufacturer's wiring diagrams, instructions and recommendations. Assemble together all equipment which requires assembling including bussing and internal wire connections where required. Connect all incoming conduit, cable and wires properly, and adjust and make ready for service electrical equipment and material required by this Contract.
   3. Perform all work in an orderly manner, and present a neat appearing installation when completed.
   4. Use plenum rated cable for spaces used for environmental air. In accessible ceiling spaces, use either plenum rated cable or cable in conduit.
   5. Install cable in conduit above inaccessible ceiling spaces and in walls.
   6. Install cable in raceway for all exposed locations.

B. Equipment
   1. Accurately set and level, neatly placed support and anchor properly. Anchor with bolts to.56G for essential equipment and.22G for nonessential equipment to prevent movements in an earthquake. No allowance will be made for negligence to foreseen or unforeseen means of placing or installing, equipment into position.
   2. Install equipment in flammable or explosive atmospheres, which is approved and listed for such application. Install all raceway and fittings in accordance with the CEC for hazardous (classified) locations.
   3. Closely coordinate installation of equipment and devices that pertain to work in other Divisions of the Specifications.

C. Devices
   1. Ceiling-type detectors:
      a. Install where shown on approved drawings.
      b. Mount units in accordance with approved drawings and manufacturer's standard details.
      c. Locate detectors with indicating light visible from floor, all oriented in the same direction.
      d. Do not conceal detectors behind HVAC ductwork.
      e. Do not locate area protection detectors in direct air stream from supply air outlets. Maintain a minimum distance of 3 feet from air outlets.
      f. Do not install smoke detectors until project area is clean, HVAC system is clean, HVAC system has run for a minimum of 3 hours and construction is finished.
   2. Manual pull stations.
      a. Install where shown on approved drawings.
      b. Mount with center of operating handle at 48 inches above the floor.
      c. Mount units in accordance with drawings and manufacturer's details.

D. Wiring
   1. Install all wiring in accordance with CEC, Article 760.
   2. Do not install fire alarm system conductors in conduits, junction boxes or outlet boxes with conductors of any other systems. Install circuits for AC separate from circuits using DC. Install each data loop separate from any other data loops. Install circuits for door holders and other non-power limited circuits in conduits separate from alarm initiating and annunciating circuits. Install all initiating devices and signaling line circuits, above-grade. Provide exposed liquid-tight flexible conduit of the minimum length required for neat and secure installation where used for attachment to water-flow and valve tamper switches or similar applications. Do not bury nor locate flexible conduit closer than 12 inches to grade.

3. Pack conduit with removable sealant where connected to ceiling or duct detectors.
4. Paint all conduits except that which is exposed in public areas red in color for six inches at least every 6 feet for the entire circumference of the conduit. Paint all concealed junction boxes red. Label junction boxes “fire alarm” with contrasting colored letters.

E. Connections: Make wire connections to terminal with terminal spade lugs or to terminal blocks approved for use without lugs. Engage the service of manufacturer’s certified technicians to make all final connections.

F. Identification: Identify all conductors with E-Z Code or Brady wire markers by zones, or equivalent, designation, at all junction boxes, detector outlets, pull stations, strobe, strobe/horn and master terminals.

G. Grounding: Permanently ground all metallic conduit, cabinets, junction boxes, and exposed non-current-carrying metal parts. Connect a separate No. 10 AWG conductor to a grounding bus bar located in each main terminal cabinet to building ground. Provide the bus bar with a minimum of 5 tubular, pressure type screw terminals, sized for No. 18 AWG through No. 10 AWG wire. Connect the ground wire for the FACP and the main terminal cabinet to the bus bar.

3.02 PERFORMANCE

A. Cutting and patching:
1. As specified in Section 01045: Cutting and Patching.
2. Perform all cutting and patching, including structural reinforcing, necessary for this work.
3. Perform no cutting or patching without prior approval. Repair damage done by cutting and patching equal to original condition.

B. Provide metal backing plates, anchor plates, and similar items that are required for anchorage for the work of this Section. Securely weld or bolt to metal framing. Wood blocking or backing will not be permitted in combination with metal framing.

C. Provide special forming, recesses, chases, and similar items and wood blocking, backing, and grounds necessary for the proper installation of the fire alarm system as part of the Work.

3.03 PROGRAMMING

A. Program the system in accord with Owner requirements.

B. Obtain a list of the room numbers from the Owner's Representative prior to beneficial occupancy of the areas. Correct all final programming and as-built drawings submitted to the Owner's Representative for Operating & Maintenance (O & M) manual to reflect correct room numbers.

C. Program as follows:
1. Program for supervisory protection connected to the following sensors:
   a. Area smoke detectors.
   b. System trouble.
2. Standardize the programming to meet Owner's nomenclature.

3.04 TESTING ACCEPTANCE

A. Obtain services of a factory trained representative of system manufacturer to supervise installation and its progress, supervise final connections to equipment and provide testing to assure that system is in proper operating condition, and is in compliance with all applicable regulations.

B. Provide 4 sets of preliminary as-built drawings for mark-up during testing. The Owner will retain these sets. Perform 2 separate tests after the system is completed. Successfully demonstrate as part of each test all functions required in the contract. Complete one test in the presence of the Owner's Representative and conduct a separate test for final acceptance by the CSFM in the presence of the Owner's Representative. Notify the Owner's Representative 5 days before date of performance and acceptance tests.

C. Furnish all labor and test equipment required for this work. Testing work is defined as that work necessary to establish that equipment has been properly assembled, connected, and checked to verify that intent and purpose of drawings, manufacturer's instruction manuals, and directions of Architect have been accomplished in a satisfactory manner. Perform re-testing of all failures to verify corrections.

D. Prior to the CSFM test, correct punch list items identified by the Owner's Representative. After re-inspection of punch list items perform additional testing necessary to verify compliance. Continue to correct and retest system until defect-free.

E. Acceptance testing will include, but not be limited to the following:
   1. Test that horns deliver the rated sound pressure levels of the specified device and 10-dB sound level above ambient level.
   2. Test that manual pull stations close the specified circuits and cause specified alarm signals.
   3. Test that automatic detectors operate when the appropriate fire or smoke conditions are generated.
   4. Test that panels and supervisory devices display and control functions specified.
   5. Test that fire alarm supervisory and trouble signals are received at the remote alarm station.
   6. Test that battery with provide 24 hour backup upon removal of AC power (4 hours if fire alarm system is supplied by emergency power).
   7. Turning over and obtaining receipt for completion of NFPA Certification Application Form.

F. Prior to performing acceptance testing:
   1. Verify entire system tests free from opens, grounds, and short circuits.
   2. Verify that horns, horn/strobes, manual pull stations, transmitters, automatic detectors and supervisory devices, and all other fire alarm system components are functioning as specified.
   3. Verify that all individual circuits are connected at panel for proper operation.
   4. Verify control circuit integrity:
   5. Verify component compliance with specifications,
   6. Open initiating device circuits and verify that the trouble signal actuates.
   7. Open and short signaling line circuits and verify that the trouble signal actuates.
   8. Open and short indicating appliance circuits and verify that trouble signal actuates.
   9. Ground all circuits and verify response of trouble signals.
   10. Check presence and audibility of all alarm notification devices.
   11. Check installation, supervision, and operation of all intelligent smoke detectors.

G. Ground tests shall meet requirements of California Code of Regulations (CCR), Title 24, Part 3.

H. After completion of testing and adjustment, operate the different systems and equipment under normal working conditions and show specified performance. If, in the opinion of the Architect, performance of equipment or systems is not in accordance with Specifications or submitted data, alter or replace equipment at no increase in Contract Sum.

I. Do not allow or cause any work to be covered up or enclosed before it has been inspected and approved. Should any work be enclosed or covered up before it has been approved, uncover such work and after it has been inspected and approved, make all repairs necessary to restore work condition in which it was found at time of cutting, all at no increase in Contract Sum.

J. Before requesting final approval of the installation, furnish a written statement to the CSFM to the effect that the system has been installed and completely tested in accordance with (2010) NFPA 72 Sections 10.18.1.3 and 14.4.1.2.

3.05 SEQUENCE OF OPERATION

A. Provide a clear and concise description of sequence of operations that gives, in detail, the information required to operate properly the equipment and system.

B. Provide type written original on 8-1/2 x 11-inch paper and an electronic copy in PDF format.

END OF SECTION

SECTION 31 20 00

EARTH MOVING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Work included: Excavating, backfilling, preparing subgrades, and compacting the site to the elevations shown on the Drawings, as specified herein, and as needed to meet the requirements of the construction shown in the Contract Documents.

1.02 RELATED SECTIONS

A. Section 31 25 13 Erosion Controls

B. Section 31 23 33 Trenching and Backfilling

C. Section 31 21 13 Site Grading

1.03 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

B. Unless otherwise noted, standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes as of the date of issue of this Project Manual.

C. Referenced Standards:

1. CalTrans Standard Specifications, Latest Edition.

1.04 SUBMITTALS

A. If geotextile submit under provisions of Section 01 33 00.

1.05 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. Use equipment adequate in size, capacity, and numbers to accomplish the work in a timely manner.

C. In addition to complying with requirements of governmental agencies having jurisdiction, comply with the directions of the OWNER like section 02 41 13.

1.06 DEFINITIONS

A. Backfill: Soil material or select material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.

2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Course placed between the subbase course and hot-mix asphalt paving.

C. Bedding Course: Course placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS

A. Fill and backfill materials:

1. Provide soil materials free from organic matter and deleterious substances, containing no rocks or lumps over 6 inches in greatest dimension, and with not more than 15% of the rocks or lumps larger than 2-3/8 inches in their greatest dimension to within 24 inches of proposed subgrade.

2. Fill material is subject to the approval of the OWNER, and is that material removed from excavations or imported from off-site borrowed areas, free from roots and other deleterious matter.

3. Do not permit rocks having a dimension greater than 1 inch in the upper 12 inches of fill or embankment.

4. Cohesionless material used for structural backfill: Provide #57 crushed stone free from organic material and other foreign matter, and as approved by the OWNER.

2.02 TOPSOIL

A. Where and if shown on the Drawings or otherwise required, provide topsoil consisting of friable, fertile soil of loamy character, containing an amount of organic matter normal to the region, capable of sustaining healthy plant life, and reasonably free from subsoils, roots, heavy or stiff clay, stones larger than 2 inches in greatest dimension, noxious weeds, sticks, brush, litter, and other deleterious matter.

B. Obtain topsoil from sources within the project limits, or provide imported topsoil obtained from sources outside the project limits, or from both sources.

2.3 GEOTEXTILES

A. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2; AASHTO M288

2. Grab Tensile Strength: 157 lbf ; ASTM D 4632.

3. Sewn Seam Strength: 142 lbf ; ASTM D 4632.

4. Tear Strength: 56 lbf ; ASTM D 4533.

5. Puncture Strength: 56 lbf ; ASTM D 4833.

6. Apparent Opening Size: No. 40 sieve, max. ASTM D 4751.

7. Permittivity: 0.5 per second, minimum; ASTM D 4491.

8. UV Stability: 50 percent after 500 hours exposure; ASTM D 4355.

B. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; with elongation less than fifty percent (50%); complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2; AASHTO M 288

2. Grab Tensile Strength: 247 lbf ; ASTM D 4632.

3. Sewn Seam Strength: 222 lbf ; ASTM D 4632.

4. Tear Strength: 90 lbf ; ASTM D 4533.

5. Puncture Strength: 90 lbf ; ASTM D 4833.

6. Apparent Opening Size: No. 60 sieve, max. ASTM D 4751.

7. Permittivity: 0.02 per second, minimum; ASTM D 4491.

8. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Notify the Engineer of conditions which may be detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.02 PROCEDURES

A. Utilities:

1. Unless to be removed, protect active utility lines.

2. If active utility lines are encountered, promptly take necessary steps to assure that service is not interrupted.

3. If service is interrupted as a result of work under this Section, immediately restore service by repairing the damaged utility at no additional cost to the Contractor or Owner.

4. If existing utilities are found to interfere with the permanent facilities being constructed under this Section, immediately notify the Contractor and secure his instructions.

5. Do not proceed with permanent relocation of utilities until written instructions are received from the Contractor.

6. Notify The OWNER not less than ten (10) days in advance if there are any proposed utility interruptions.

7. Do not proceed with utility interruptions without The OWNER'S written permission.

B. Protection of persons and property:

C. Dewatering:

1. Remove Barricade open holes and depressions occurring as part of this Work, and post warning lights on property adjacent to or with public access.

2. Operate warning lights during hours from dusk to dawn each day and as otherwise required.

3. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, washout, and other hazards created by operations under this Section.

4. All water, including rain water, encountered during trench and substructure work to an approved location by pumps, drains, and other approved methods.

5. Keep excavations and site construction area free from water.

D. Use means necessary to prevent dust from becoming a nuisance to the public, to neighbors, and to other work being performed on or near the site.

E. Maintain access to adjacent areas at all times.

3.03 EXCAVATING

A. Perform excavating of every type of material encountered within the limits of the Work to the lines, grades, and elevations indicated and specified herein.

B. Satisfactory excavated materials:

1. Transport to, and place in, fill or embankment areas within the limits of the Work.

C. Unsatisfactory excavated materials:

1. Excavate to a distance below grade and replace with satisfactory materials.

2. Include excavation of unsatisfactory materials, and replacement by satisfactory materials, as parts of the work of this Section.

D. Surplus materials:

1. Dispose of unsatisfactory excavated materials, and surplus satisfactory excavated material, away from the site at disposal areas.

E. Maintenance of drainage:

1. Excavate and backfill in a manner and sequence that will provide proper drainage at all times.

F. Ditches and gutters:

1. Cut accurately to the cross sections, grades, and elevations shown.

2. Maintain excavations free from detrimental quantities of leaves, sticks, trash, and other debris until completion of the Work.

3. Dispose of excavated materials as directed by the Contractor except do not, in any case, deposit materials less than 3'-0" from the edge of a ditch.

G. Unauthorized excavation:

1. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific instruction from the OWNER.

2. Under footings, foundations, or retaining walls:

a. Fill unauthorized excavation by extending the indicated bottom elevation of the footing or base to the excavation bottom, without altering the required top elevation.

b. When acceptable to City, lean concrete fill may be used to bring bottom elevations to proper position.

3. Elsewhere, backfill and compact unauthorized excavations as specified for authorized excavations.

4. Stability of excavations:

a. Slope sides of excavation to 1:1 or flatter.

b. Shore and brace where sloping is not possible because of space restrictions or stability of the materials being excavated.

c. Maintain sides and slopes of excavations in a safe condition until completion of backfilling.

H. Shoring and bracing:

1. Provide materials for shoring and bracing as may be necessary for safety of personnel, protection of work, and compliance with requirements of governmental agencies having jurisdiction.

2. Maintain shoring and bracing in excavations regardless of the time period excavations will be open.

3. Carry shoring and bracing down as excavation progresses.

3.04 FILLING AND BACKFILLING

A. Backfill excavations as promptly as progress of the Work permits, but not until:

1. Acceptance of construction below finish grade:

2. Inspecting, testing, approving, and recording locations of underground utilities;

3. Concrete formwork is removed;

4. Shoring and bracing are removed, and voids have been backfilled with satisfactory materials;

5. Trash and debris have been removed; and

6. Horizontal bracing is in place on horizontally supported walls.

B. Ground surface preparation:

1. Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from the ground surface prior to placement of fills.

2. Plow, strip, or break up surfaces steeper than one vertical to four horizontal, so that fill material will bond with existing surface.

3. Prepare the subgrade soils per the project geotechnical report.

C. Placing and compacting:

1. Place fill materials in layers not more than 8" (eight inches) in loose depth when using heavy compaction equipment and 4” (four inches) loose depth for material compacted using hand operated tampers.

2. Before compacting, moisten or aerate each layer as necessary to provide the moisture content as required by this specification.

3. Compact each layer to required percentage of maximum density for the area.

4. Do not place backfill or fill material on surfaces that are muddy, frozen, or containing frost or ice.

5. Place backfill and fill materials evenly adjacent to structures, to required elevations.

6. Take care to prevent wedging action of backfill against structures by carrying the material uniformly around the structures to approximately the same elevation in each lift.

3.05 GRADING

A. General:

1. Uniformly grade the areas within limits of grading under this Section, including adjacent transition areas.

2. Smooth the finished surfaces within specified tolerance.

3. Compact with uniform levels or slopes between points where elevations are shown on the Drawings, or between such points and existing grades.

4. Where a change of slope is indicated on the Drawings, construct a rolled transition section having a minimum radius of approximately 8'-0", unless adjacent construction will not permit such a transition, or if such a transition defeats positive control of drainage.

3.06 COMPACTING

A. Control soil compaction during construction to provide the specified Standard Proctor Compaction for each area as determined according to ASTM D 698.

B. Provide not less than the following density of soil material compacted at optimum moisture content for the actual density of each layer of soil material in place, and as specified by the project geotechnical report , and as approved by the City.

1. Structures, Building Slabs, Pavements, and Steps:

   a. Per the project soils report.

2. Lawn and unpaved areas:

   a. Compact the top 8 inches of subgrade and each layer of fill material or backfill material to 85 percent of the soils maximum dry density as determined by the standard Proctor compaction test (ASTM D 698).

3. Walks:

   a. Per the project soils report.

4. Pavements:

   a. Per the project soils report.

C. Moisture control:

1. Where subgrade or layer of soil material must be moisture-conditioned before compacting, uniformly apply water to surface of subgrade or layer of soil material to prevent free water appearing on surface during or subsequent to compacting operations.

2. Remove and replace, or scarify and air dry, soil material that is too wet to permit compacting to the specified density.

3. Soil material that has been removed because it is too wet to permit compacting may be stockpiled or spread and allowed to dry. Assist drying by discing, harrowing, or pulverizing until moisture content is reduced to a satisfactory value as determined by moisture-density relation tests approved by the owner's representative.

4. The moisture content of the fill material shall be no more than +2% of optimum moisture as determined by ASTM D698.

3.07 FIELD QUALITY CONTROL

A. The Contractor's quality control manager or designee shall inspect and approve subgrades and fill layers before subsequent construction is permitted thereon.

B. The Contractor will have at least the following compaction tests conducted to the approval of the owners representative:

1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least 1 test for every 2000 sq. ft. or less of paved area or building slab, but in no case fewer than 3 tests.

2. Foundation Wall Backfill: At each compacted backfill layer, at least 1 test for each 100 feet or less of wall length, but no fewer than 2 tests.

3. Trench Backfill: At each compacted initial and final backfill layer, at least 1 test for each 100 feet or less of trench length, but no fewer than 2 tests.

C. If, in the Contractor 's opinion based on reports of the testing laboratory, subgrade or fills which have been placed are below specified density, provide additional compacting and testing under the provisions of these Specifications.

3.08 MAINTENANCE

A. Protection of newly graded areas:

1. Protect newly graded areas from traffic and erosion, and keep free from trash and weeds;

2. Repair and reestablish grades in settled, eroded, and rutted areas to the specified tolerances.

B. Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify the surface, reshape, and compact to the required density prior to further construction.

3.09 CERTIFICATION

A. Upon completion of this portion of the Work, and as a condition of its acceptance, the Contractor will secure a written report from the testing agency certifying that the compaction requirements have been obtained. The report will state the area of fill or embankment, the compaction density obtained, and the type or classification of fill material placed.

3.10 EROSION CONTROL

A. BMP’s (Best Management Practices) shall be placed at the locations shown on the Drawings.

B. Sediment deposited at BMP’s shall be removed and properly disposed of when deemed necessary. When their usefulness has ended and the site is stabilized and re-vegetated, temporary BMP’s shall be removed after any sediment trapped by them is removed and disposed of properly. Any area disturbed during removal of the temporary BMP’s shall be re-graded then seeded and protected.

END OF SECTION

SECTION 31 21 13

SITE GRADING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included: Excavating, backfilling, preparing subgrades, and compacting the site to the elevations shown on the Drawings, as specified herein, and as needed to meet the requirements of the construction shown in the Contract Documents.

B. Related work: Documents affecting work of this Section include, but are not limited to, General Conditions, Supplementary Conditions, and Sections in Division 0, 1 and 2 of these Specifications and:

1. Section 01 21 00 – Allowances – Additional site grading work if required by proof rolling
2. Section 31 21 13 – Site Grading
3. Section 31 25 13 – Erosion Controls
4. Section 31 23 33 – Trenching and Backfilling
5. Storm Water Pollution Prevention Plan (SWPPP).
6. Construction Drawings.

1.02 QUALITY ASSURANCE

A. Use an adequate number of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods needed for proper performance of the Work of this Section.

B. Use equipment adequate in size, capacity, and numbers to accomplish the work in a timely manner.

C. In addition to complying with requirements of governmental agencies having jurisdiction, the Contractor must comply with the directions of the Owner.

1.03 PRODUCT HANDLING

A. Comply with pertinent provisions of Division 0 and 1 of the specifications.

1.04 SUBMITTALS

A. If geotextile fabrics and/or geogrid are to be used, proposed material data sheets shall be sent to the Civil Engineer of Record before installation of fabric or grid.

B. Each type of plastic warning tape must be submitted.

1.05 DEFINITIONS

A. Backfill: Soil material or selected material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.

2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Course placed between the subbase course and hot-mix asphalt paving.

C. Bedding Course: Course placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS

A. Fill and backfill materials:

1. Provide soil materials free from organic matter and deleterious substances, containing no rocks or lumps over 6 inches in greatest dimension, and with not more than 15% of the rocks or lumps larger than 2-3/8 inches in their greatest dimension to within 24 inches of proposed subgrade.

2. Fill material is subject to the approval of the Owner, Material removed from excavations or imported from off-site borrow areas must be free from roots and other deleterious matter.

3. Do not permit rocks with a dimension greater than 1 inch in the upper 12 inches of fill or embankment.

4. Cohesionless material used for structural backfill: Provide #57 crushed stone free from organic material and other foreign matter, and as approved by the Owner.

2.02 TOPSOIL

A. Where and if shown on the Drawings or as otherwise required, provide topsoil consisting of friable, fertile soil of loamy character, containing an amount of organic matter normal to the region, capable of sustaining healthy plant life, and reasonably free from subsoils, roots, heavy or stiff clay, stones larger than 2 inches in greatest dimension, noxious weeds, sticks, brush, litter, and other deleterious matter.

B. Obtain topsoil from sources within the project limits, or provide imported topsoil obtained from sources outside the project limits, or from both sources.

2.03 GEOTEXTILES

A. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2; AASHTO M288
2. Grab Tensile Strength: 157 lbf ; ASTM D 4632.
3. Sewn Seam Strength: 142 lbf ; ASTM D 4632.
4. Tear Strength: 56 lbf ; ASTM D 4533.
5. Puncture Strength: 56 lbf ; ASTM D 4833.
6. Apparent Opening Size: No. 40 sieve, max. ASTM D 4751.

7. Permittivity: 0.5 per second, minimum; ASTM D 4491
8. UV Stability: 50 percent after 500 hours exposure; ASTM D 4355.

B. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; with elongation less than fifty percent (50%); complying with AASHTO M 288 as well as the following, measured per test methods referenced:

1. Survivability: Class 2; AASHTO M 288
2. Grab Tensile Strength: 247 lbf ; ASTM D 4632.
3. Sewn Seam Strength: 222 lbf ; ASTM D 4632.
4. Tear Strength: 90 lbf ; ASTM D 4533.
5. Puncture Strength: 90 lbf ; ASTM D 4833.
6. Apparent Opening Size: No. 60 sieve, max. ASTM D 4751.
7. Permittivity: 0.02 per second, minimum; ASTM D 4491.
8. 8. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Notify the Owner of conditions which may be detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.02 PROCEDURES

A. Utilities:

1. Unless utility are to be removed, protect active utility lines.

2. If active utility lines are encountered, promptly take necessary steps to assure that service is not interrupted.

3. If service is interrupted as a result of work under this Section, immediately restore service by repairing the damaged utility at no additional cost to the Contractor or Owner.

4. If existing utilities are found to interfere with the permanent facilities being constructed under this Section, immediately notify the Contractor and secure his instructions.

5. Do not proceed with permanent relocation of utilities until written instructions are received from the Contractor.

6. Notify The Owner’s Site Manager not less than ten (10) days in advance if there are any proposed utility interruptions.

7. Do not proceed with utility interruptions without The Owner’s Site Manager’s written permission.

B. Protection of persons and property:

1. Barricade open holes and depressions occurring as part of this Work, and post warning lights on property adjacent to or with public access.

2. Operate warning lights during hours from dusk to dawn each day, and as otherwise required.

3. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, washout, and other hazards created by operations under this Section.

C. Dewatering:

1. Remove all water, including rain water, encountered during trench and substructure work to an approved location by pumps, drains, and other approved methods.

2. Keep excavations and site construction area free from water.

D. Use means necessary to prevent dust from becoming a nuisance to the public, to neighbors, and to other work on or near the site.

E. Maintain access to adjacent areas at all times.

3.03 EXCAVATING

This section covers excavation of every type of material encountered within the limits of the Work to the lines, grades, and elevations indicated and specified herein.

A. Satisfactory excavated materials:

1. Transport to and place in, fill or embankment areas within the limits of Work.

B. Unsatisfactory excavated materials:

1. Excavate to a distance below grade as directed by the Owner, and replace with satisfactory materials.

2. Include excavation of unsatisfactory materials, and replacement by satisfactory materials, as parts of the work of this Section.

C. Surplus materials:

1. Dispose of unsatisfactory excavated materials, and surplus satisfactory excavated material, away from the site at disposal areas.

D. Maintenance of drainage:
1. Excavate and backfill in a manner and sequence that will provide proper drainage at all times.

E. Ditches and gutters:

1. Cut accurately to the cross sections, grades, and elevations shown.

2. Maintain excavations free from detrimental quantities of leaves, sticks, trash, and other debris until completion of the Work.

3. Dispose of excavated materials as directed by the Contractor, except do not under any circumstance deposit materials less than 3'-0" from the edge of a ditch.

F. Unauthorized excavation:

1. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific instruction from the Owner.

2. Under footings, foundations, or retaining walls:

   a. Fill unauthorized excavation by extending the indicated bottom elevation of the footing or base to the excavation bottom, without altering the required top elevation.
   b. When acceptable to the Owner, lean concrete fill may be used to bring bottom elevations to proper position.

3. Elsewhere, backfill and compact unauthorized excavations as specified for authorized excavations, unless otherwise directed by the D/B.

G. Stability of excavations:

1. Slope sides of excavation to 1:1 or flatter, unless otherwise directed by the Owner.

2. Shore and brace where sloping is not possible because of space restrictions or stability of the materials being excavated.

3. Maintain sides and slopes of excavations in a safe condition until completion of backfilling.

H. Shoring and bracing:

1. Provide materials for shoring and bracing as may be necessary for safety of personnel, protection of work, and compliance with requirements of governmental agencies having jurisdiction.

2. Maintain shoring and bracing in excavations regardless of the time period excavations will be open.

3. Carry shoring and bracing down as excavation progresses.

3.04 FILLING AND BACKFILLING

A. Backfill excavations as promptly as progress of the Work permits, but not until:

1. Acceptance of construction below finish grade:

2. Inspecting, testing, approving, and recording locations of underground utilities;

3. Concrete formwork is removed;

4. Shoring and bracing are removed, and voids have been backfilled with satisfactory materials;

5. Trash and debris have been removed; and

6. Horizontal bracing is in place on horizontally supported walls.

B. Ground surface preparation:

1. Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from the ground surface prior to placement of fills.

2. Plow, strip, or break up surfaces steeper than one vertical to four horizontal, so that fill material will bond with existing surface.

3. Prepare the subgrade soils per the project geotechnical report.

C. Placing and compacting:

1. Place fill materials in layers not more than 8" (eight inches) in loose depth when using heavy compaction equipment and 4” (four inches) loose depth for material compacted using hand operated tampers.

2. Before compacting, moisten or aerate each layer as necessary to provide the moisture content as required by this specification.

3. Compact each layer to the required percentage of maximum density for the area.

4. Do not place backfill or fill material on surfaces that are muddy, frozen, or containing frost or ice.

5. Place backfill and fill materials evenly adjacent to structures, to required elevations.

6. Take care to prevent wedging action of backfill against structures by carrying the material uniformly around the structures to approximately the same elevation in each lift.

3.05 GRADING

A. General:

1. Uniformly grade the areas within limits of grading under this Section, including adjacent transition areas.

2. Smooth the finished surfaces within specified tolerance.

3. Compact with uniform levels or slopes between points where elevations are shown on the Drawings, or between such points and existing grades.

4. Where a change of slope is indicated on the Drawings, construct a rolled transition section having a minimum radius of approximately 8'-0", unless adjacent construction will not permit such a transition, or if such a transition defeats positive control of drainage.

3.06 COMPACTING

A. Control soil compaction during construction to provide the specified Standard Proctor Compaction for each area as determined according to ASTM D 698.

B. Provide not less than the following density of soil material compacted at optimum moisture content for the actual density of each layer of soil material in place, and as specified by the project geotechnical report , and as approved by the Owner.

1. Structures, Building Slabs, Pavements, and Steps:
   a. Per the project soils report.

2. Lawn and unpaved areas:
   a. Compact the top 8 inches of subgrade and each layer of fill material or backfill material to 85 percent of the soils maximum dry density as determined by the standard Proctor compaction test (ASTM D 698).

3. Walks:
   a. Per the project soils report.

4. Pavements:
   a. Per the project soils report.

C. Moisture control:

1. Where subgrade or layer of soil material must be moisture-conditioned before compacting, uniformly apply water to surface of subgrade or layer of soil material to prevent free water appearing on surface during or subsequent to compacting operations.

2. Remove and replace, or scarify and air dry, soil material that is too wet to permit compacting to the specified density.

3. Soil material that has been removed because it is too wet to permit compacting may be stockpiled or spread and allowed to dry. Assist drying by discing, harrowing, or pulverizing until moisture content is reduced to a satisfactory value as determined by moisture-density relation tests approved by the owners representative.

4. The moisture content of the fill material shall be no more than +2% of optimum moisture as determined by ASTM D698.

3.07 FIELD QUALITY CONTROL

A. The Contractor's quality control manager or designee shall inspect and approve subgrades and fill layers before subsequent construction is permitted thereon.

B. The Contractor will have at least the following compaction tests conducted to the approval of the owners representative:

1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least 1 test for every 2000 sq. ft. or less of paved area or building slab, but in no case fewer than 3 tests.

2. Foundation Wall Backfill: At each compacted backfill layer, at least 1 test for each 100 feet or less of wall length, but no fewer than 2 tests.

3. Trench Backfill: At each compacted initial and final backfill layer, at least 1 test for each 100 feet or less of trench length, but no fewer than 2 tests.

C. If, in the Owner 's opinion based on reports of the testing laboratory, subgrade or fills which have been placed are below specified density, provide additional compacting and testing under the provisions of Section 003132 of these Specifications.

3.08 MAINTENANCE

A. Protection of newly graded areas:

1. Protect newly graded areas from traffic and erosion, and keep free from trash and weeds;

2. Repair and reestablish grades in settled, eroded, and rutted areas to the specified tolerances.

B. Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify the surface, reshape, and compact to the required density prior to further construction.

3.09 CERTIFICATION

A. Upon completion of this portion of the Work, and as a condition of its acceptance, the Contractor will secure a written report from the testing agency certifying that the compaction requirements have been obtained. The report will state the area of fill or embankment, the compaction density obtained, and the type or classification of fill material placed.

3.10 EROSION CONTROL

A. BMP's (Best Management Practices) shall be placed at the locations shown on the Drawings.

B. Sediment deposited at BMP's shall be removed and properly disposed of when deemed necessary. When their usefulness has ended and the site is stabilized and re-vegetated, temporary BMP's shall be removed after any sediment trapped by them is removed and disposed of properly. Any area disturbed during removal of the temporary BMP's shall be regraded then seeded and protected.

END OF SECTION

SECTION 31 23 33

TRENCHING AND BACKFILLING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Work included: Trench, backfill, and compact as specified herein and as needed for installation of underground utilities associated with the Work.

1.02 RELATED SECTIONS

A. Section 31 25 13 Erosion Controls

B. Section 31 21 13 Site Grading

C. Section 02 41 13 Selective Site Demolition

1.03 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

B. Unless otherwise noted, standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes as of the date of issue of this Project Manual.

C. Referenced Standards:

1. CalTrans Standard Specifications.

1.04 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. Use equipment adequate in size, capacity, and numbers to accomplish the work of this Section in accordance with the established schedule.

C. In addition to complying with requirements of governmental agencies having jurisdiction, comply with the directions of the geotechnical engineer.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS

A. Backfill materials:

1. Provide soil materials free from organic matter and deleterious substances, containing no rocks or lumps over 3 inches in greatest dimension, and with not more than 15% of the rocks or lumps larger than 3 inches in their greatest dimension.

2. Fill material is subject to the approval of the geotechnical engineer, and is that material removed from excavations or imported from off-site borrow areas, predominantly non-expansive soil free from organics and other deleterious matter.

3. Do not permit rocks having a dimension greater than 1 inch in the upper 12 inches of fill.

4. Cohesionless material used for backfill: Provide sand free from organic material and other foreign matter, and as approved by the geotechnical engineer.

5. Where aggregate backfill is called for provide aggregate complying with requirements in Section 19-3 of the California Department of Transportation Standard Specification, Latest Edition.

2.02 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected for the work subject to the approval of the Owner.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.02 FINISH ELEVATIONS AND LINES

A. Comply with pertinent provision of these specifications.

3.03 PROCEDURES

A. Utilities:

1. Unless shown to be removed, protect active utility lines shown on the drawings or otherwise made known to the Contractor prior to trenching. If damaged, repair or replace at no additional cost to the Owner.

2. Utility paths are shown diagrammatically on the Plans and it is the Contractor’s responsibility to determine the actual routes. The Contractor shall promptly take necessary steps to assure that service is not interrupted.

3. If service is interrupted as a result of work under this Section, immediately restore service by repairing the damaged utility at no additional cost to the Owner.

4. If existing utilities are found to interfere with the permanent facilities being constructed under this Section, immediately notify the ENGINEER and secure his instructions.

5. Do not proceed with permanent relocation of utilities until written instructions are received from the Owner.

6. Notify The OWNER not less than ten days in advance if there are any proposed utility interruptions.

7. Do not proceed with utility interruptions without the OWNER'S written permission.

B. Protection of persons and property:

1. Barricade and maintain protection in open holes and depressions occurring as part of the Work, and post warning lights on property adjacent to or with public access.

2. Operate warning lights during hours from dusk to dawn each day and as otherwise required.

3. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, washout, and other hazards created by operations under this Section.

C. Dewatering:

1. Remove all water, including rain water, encountered during trench and sub-structure work to an approved location by pumps, drains, and other approved methods.

2. Keep trenches and site construction area free from water.

D. Use means necessary to prevent dust becoming a nuisance to the public, to neighbors, and to other work being performed on or near the site.

E. Maintain access to adjacent areas at all times.

3.04 TRENCHING

A. Comply with pertinent provisions of these specifications, and the provisions of this Section.

B. Provide sheeting and shoring necessary for protection of the Work and for the safety of personnel.

1. Prior to backfilling, remove all sheeting.

2. Do not permit sheeting to remain in the trenches.

C. Open cut:

1. Excavate for utilities by open cut.

2. If conditions at the site prevent such open cut, and if approved by the Owner, tunneling may be used.

3. Short sections of a trench may be tunneled if, in the opinion of the Owner, the conductor can be installed safely and backfill can be compacted properly into such tunnel.

4. Where it becomes necessary to excavate beyond the limits of normal excavation lines in order to remove boulders or other interfering objects, backfill the voids remaining after removal of the objects as directed by the geotechnical engineer.
5. When the void is below the subgrade for the utility bedding, use suitable earth materials and compact to the relative density as directed by the geotechnical engineer.

6. When the void is in the side of the utility trench or open cut, use suitable earth or sand compacted or consolidated as directed by the geotechnical engineer and specified in these specifications.

7. Remove boulders and other interfering objects, and backfill voids left by such removals, at no additional cost to the Owner.

8. Excavating for appurtenances:

   a. Excavate for manholes and similar structures to a distance sufficient to leave at least 12 inches clear between outer surfaces and the embankment or shoring that may be used to hold and protect the banks.

   b. Over-depth excavation beyond such appurtenances that has not been directed will be considered unauthorized. Fill with sand, gravel, or lean concrete as directed by the geotechnical engineer, and at no additional cost to the Owner.

D. Trench to the minimum width necessary for proper installation of the utility, with sides as nearly vertical as possible. Accurately grade the bottom to provide uniform bearing for the utility.

E. Where trenching occurs in existing lawns, remove turf in sections and keep damp. Replace turf upon completion of the backfilling.

F. Cover:

9. Provide minimum trench depth indicated below to maintain a minimum cover over the top of the installed item below the finish grade:

   a. Areas subject to vehicular traffic:
      1) Sanitary sewers: 36";
      2) Storm drains: 24".

   b. Areas not subject to vehicular traffic:
      1) Sanitary sewers: 30";
      2) Storm drains: 12".

   c. All areas:
      1) Water lines: 30";
      2) Natural gas lines: 30";
      3) Electrical cables: 42";
      4) Electrical ducts: 36".

   d. Concrete encased:
      1) Pipe sleeves for water and gas lines: 24";
      2) Sanitary sewers and storm drains: 12";
      3) Electrical ducts: 24".

10. Where utilities are under a concrete structure slab or pavement, the minimum depth need only be sufficient to completely encase the conduit or pipe sleeve, and electrical long-radius rigid metal conduit riser, provided it will not interfere with the structural integrity of the slab or pavement.

11. Where the minimum cover is not provided, encase the pipes in concrete to 6 inches from outside diameter. Fill void between outside wall of utility and concrete with fine sand or other material approved by the geotechnical engineer. Provide concrete with a minimum

twenty-eight (28) day compressive strength of 3500 psi. Place warning tape on top of concrete cap longitudinally with the buried utility.

3.05 BEDDING

A. Provide bedding as indicated on the Drawings.

3.06 BACKFILLING

A. General:

1. Compaction of trenches shall be according to the project drawings.

2. Do not completely backfill trenches until required pressure and leakage tests have been performed, and until the utilities systems as installed conform to the requirements specified in the pertinent Sections of these Specifications.

3. Except as otherwise specified or directed for special conditions, backfill trenches to the ground surface with selected material approved by the geotechnical engineer.

4. Reopen trenches which have been improperly backfilled, to a depth as required for proper compaction. Refill and compact as specified, or otherwise correct to the approval of the geotechnical engineer.

5. Do not allow or cause any of the Work performed or installed to be covered up or enclosed by work of this Section prior to required inspections, tests, and approvals.

6. Should any of the Work be so enclosed or covered up before it has been approved, uncover all such Work and, after approvals have been made, refill and compact as specified, all at no additional cost to the Owner.

B. Lower portion of trench:

1. Deposit approved backfill and bedding material in layers of 6 inch maximum thickness, and compact with suitable tampers to the density specified in the project drawings, until there is a cover of not less than 24 inches over sewers and 12 inches over other utility lines.

2. Take special care in backfilling and bedding operations to not damage pipe and pipe coatings.

C. Remainder of trench:

1. Except for special materials for pavements, backfill the remainder of the trench with material free from stones larger than 3 inches or 1/2 the layered thickness, whichever is smaller, in any dimension.

3.07 COMPACTION

A. Compact each layer of backfill material according to the project drawings.

3.08 TEST FOR DISPLACEMENT OF STORM AND SANITARY SEWERS

A. Check sewers and storm drains to determine whether displacement has occurred after the trench has been backfilled to above the pipe and has been compacted as specified.

B. Flash a light between manholes or, if the manholes have not yet been constructed, between the locations of the manholes, by means of a flashlight or by reflecting sunlight with a mirror.

C. If the illuminated interior of the pipe line shows poor alignment, displaced pipes, or any other defects, correct the defects to the specified conditions and at no additional cost to the Owner.

3.09 PIPE BORING AND JACKING

A. The Contractor may, at his option, install steel pipe casings, tongue-and-groove reinforced concrete pipes, and steel pipes under existing roads or pavements by boring and jacking into place using procedures approved by the governmental agencies having jurisdiction and approved by the geotechnical engineer.

3.10 TUNNELING OPERATIONS

A. The Contractor may, at his option, tunnel pipes into position using procedures approved by the geotechnical engineer and the governmental agencies having jurisdiction.

3.11 FIELD QUALITY CONTROL

A. The geotechnical engineer will inspect and approve open cuts and trenches before installation of utilities, and will make the following tests:

1. Assure that trenches are not backfilled until all tests have been completed.

2. Check backfilling for proper layer thickness and compaction.

3. Verify that compaction test results conform to the specified requirements, and that at each compacted initial and final backfill layer, at least one (1) test for each 100 feet or less of trench length, but no fewer than two (2) tests are performed.

4. Assure that defective work is removed and properly replaced.

END OF SECTION

SECTION 31 25 13

EROSION CONTROLS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Work included: The work included in this Section includes all labor, materials, and equipment necessary to place temporary and permanent erosion and sediment control measures as detailed on the Drawings and specified herein. **Contractor shall be responsible for implementation of the Erosion Control Plans for the project. The Erosion Control Plan included in the project drawings can and shall be modified accordingly by the contractor throughout construction to comply with the State Water Resources Control Board Standards for construction.**

1.01 RELATED SECTIONS

A. Section 02 41 13 Selective Site Demolition

B. Section 31 21 13 Site Grading

1.02 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

B. Unless otherwise noted, standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes as of the date of issue of these Specifications.

C. Referenced Standards

1. All work to be done in accordance with the City of Stockton Standard Specifications and Drawings, where conflicts occur between the City of Stockton Standard Specifications and Drawings and the specifications noted herein, the more stringent interpretation shall apply.

2. All work to be done in accordance with the State Water Resources Control Board Standards for Erosion and Sediment Control.

3. CalTrans Standard Specifications.

1.04 QUALITY ASSURANCE AND CONTROL

A. Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.05 ENVIRONMENTAL REQUIREMENTS

A. Protect adjacent properties and water resources from erosion and sediment damage throughout life of contract.

1.06 SUBMITTALS

A. Project Data:

1. Materials list of items proposed to be provided under this Section.

2. Specifications and other data needed to prove compliance with the specified requirements.

3. Weekly Inspection Reports, Before, During and Post Rain Event Inspection Reports and any other testing or inspection report required by the State Water Resources Control Board in compliance of their Standards. Please note that inspections must be done at a minimum of once a week and those reports kept on file at the job trailer. Do not mail to state or city offices. A copy of the reports and inspections should be attached to the SWPP Plan.

PART 2 – PRODUCTS

2.01 FOR EROSION AND SEDIMENT CONTROL

A. The primary erosion and sediment control measures implemented during the Mass Grading/Site Preparation phase of the project shall be inspected, maintained, and repaired in accordance with the Erosion Control Plan provided in the Civil Plans. Secondary measures such as Inlet Protection, dust control, erosion control blanket, temporary and permanent seeding shall be installed/applied as necessary. See Civil Plans for placement of BMP's and the Erosion Control Details for further information.

B. Inlet Protection as shown on the Erosion Control Plan provided in the Civil Plans.

PART 3 - EXECUTION

3.01 EROSION CONTROL PLAN IMPLEMENTATION

A. Review Civil Plans for Erosion Control Plan requirements.

3.02 EROSION CONTROL PLAN IMPLEMENTATION

A. Place erosion control and storm water pollution prevention measures in accordance with the approved Contract Documents as construction proceeds and the appropriate phase is in progress for each measure.

B. Permanent erosion control measures shall be incorporated into the Project at the earliest practical time to minimize the need for temporary controls.

3.03 PERMANENT AND TEMPORARY SEEDING MEASURES

A. Permanently seed and mulch cut slopes as excavation proceeds to extent considered desirable and practical.

B. Slopes that erode easily or that will not be graded for a period of fourteen (14) days or more shall be temporarily seeded as work progresses with temporary seeding.

3.04 REMOVAL OF EROSION AND SEDIMENT CONTROL MEASURES

A. When site is ninety-five percent (95%) re-vegetated and stabilized with grasses, remove temporary sediment risers. Remove accumulated sediment and regrade area to original contours. Seed and protect with permanent grass seed mixture.

B. Remove drainage structure inlet protection.

C. Remove silt fence and temporary check dams. Seed and protect any disturbed areas with permanent grass seed mixture.

END OF SECTION

This page intentionally left blank

SECTION 32 11 23

AGGREGATE BASE COURSE

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Aggregate base course.

1.02 RELATED SECTIONS

A. Section 32 12 16 Asphalt Paving

B. Section 32 13 13 Concrete Paving

C. Section 31 21 13 Site Grading

1.03 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

B. Unless otherwise noted, standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes as of the date of issue of this Project Manual.

C. Referenced Standards:

1. CalTrans Standard Specifications.

2. American Association of State Highway and Transportation Officials:

3. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

4. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).

5. ASTM D1556 - Standard Test Method for Density of Soil in Place by the Sand-Cone Method.

6. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.04 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Coarse Aggregate Fill Type according to CalTrans standards:

1. Basis of Measurement: By the square foot to elevations indicated on Drawings.

2. Basis of Payment: Includes supplying fill material, stockpiling, scarifying substrate surface, placing where required, and compacting.

B. Fine Aggregate Fill Type according to CalTrans standards:

1. Basis of Measurement: By the square foot to elevations indicated on Drawings.

2. Basis of Payment: Includes supplying fill material, stockpiling, scarifying substrate surface, placing where required, and compacting.

1.05 SUBMITTALS

A. Samples: Submit, in air-tight containers, 10 lb sample of each type of fill to testing laboratory.

B. Materials Source: Submit name of imported materials suppliers.

C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.06 QUALITY ASSURANCE

A. Furnish each aggregate material from single source throughout the Work.

B. Perform Work in accordance with Caltrans standards.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Fine Aggregate Sand: As specified in CalTrans standards.

B. Class 2 Aggregate Base: As specified in CalTrans standards.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify substrate has been inspected, gradients and elevations are correct, and are dry.

3.02 PREPARATION

A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and recompacting.

B. Do not place fill on soft, muddy, or frozen surfaces.

3.03 AGGREGATE PLACEMENT

A. Place aggregate in maximum 4 inch layers and roller compact to specified density.

B. Level and contour surfaces to elevations and gradients indicated.

C. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.

D. Maintain optimum moisture content of fill materials to attain required compaction density.

Use mechanical tamping equipment in areas inaccessible to compaction equipment.

3.04 TOLERANCES

A. Maximum Variation from Flat Surface: 1/4 inch measured with 10 foot straight edge.

B. Maximum Variation From Thickness: 1/4 inch.

C. Maximum Variation From Elevation: 1/4 inch.

3.05 FIELD QUALITY CONTROL

A. Compaction testing will be performed in accordance with ASTM D1556 and ASTM D698.

B. When tests indicate Work does not meet specified requirements, remove Work, replace and re-test.

END OF SECTION

This page intentionally left blank

SECTION 32 12 16

ASPHALT PAVING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Section Includes:

1. Asphaltic concrete paving, wearing, binder and base course.
2. Surface sealer.
3. Paving fabrics.
4. Aggregate subbase course.

1.02 RELATED SECTIONS

A. Section 32 11 23 Aggregate Base Course

B. Section 31 21 13 Site Grading

1.03 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

B. Unless otherwise noted, standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes as of the date of issue of this Project Manual.

C. Referenced Standards:

1. CalTrans Standard Specifications.
2. City of Stockton Standard Specifications
3. American Association of State Highway and Transportation Officials:
4. AI MS-2 - Mix Design Methods for Asphalt Concrete and Other Hot- Mix Types.
5. AI MS-19 - Basic Asphalt Emulsion Manual.
6. ASTM D946 - Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction.
7. ASTM D3381 - Standard Specification for Viscosity-Graded Asphalt Cement for Use in Pavement Construction.

1.04 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Asphalt Pavement Mix (Base Course):

1. Basis of Measurement: By cubic yard.

2. Basis of Payment: Includes preparing base, primer, tack coating surfaces, placing, compacting and rolling, testing. Includes mix design, supplying to site, testing.

B. Asphalt Pavement Mix (Wearing Course):

1. Basis of Measurement: By cubic yard.

2. Basis of Payment: Includes primer, tack coating surfaces, placing, compacting and rolling, testing. Includes mix design, supplying to site, testing.

1.05 PERFORMANCE REQUIREMENTS

A. Paving: Designed for main street arteries.

1.06 SUBMITTALS

A. Product Data: Submit product information and mix design.

1.07 QUALITY ASSURANCE

A. Perform Work in accordance with California Department of Transportation Public Work's standards.

B. Mixing Plant: Conform to California Department of Transportation Public Work's standards.

C. Obtain materials from same source throughout.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Do not place asphalt when ambient air or base surface temperature is less than 40 degrees F, or surface is wet or frozen.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Asphalt Cement: In accordance with Section 39 of California Department of Transportation Public Work's standards.

B. Aggregate for Base Course Mix: In accordance with California Department of Transportation Public Work's standards.

C. Aggregate for Wearing Course Mix: In accordance with California Department of Transportation Public Work's standards.

D. Tack Coat: In accordance with California Department of Transportation Public Work's standards.

E. Petromat 4598 or Mirapave RG4, Petrotack or Miratack all in accordance with CalTrans Section 88.

2.02 ASPHALT PAVING MIX

A. Use dry material to avoid foaming. Mix uniformly.

B. Base Course: In accordance with California Department of Transportation Public Work's standards.

C. Wearing Course: In accordance with California Department of Transportation Public Work's standards.

2.03 SOURCE QUALITY CONTROL AND TESTS

A. Submit proposed mix design of each class of mix for review prior to beginning of Work.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify compacted subgrade subbase is dry and ready to support paving and imposed loads.

B. Verify gradients and elevations of base are correct.

C. Verify gutter drainage grilles and frames, manhole frames, and are installed in correct position and elevation.

3.02 SUBBASE

A. Prepare subbase in accordance with California Department of Transportation standards.

3.03 PREPARATION – PRIMER

A. Apply primer in accordance with California Department of Transportation standards.

3.04 PREPARATION - TACK COAT

A. Apply tack coat in accordance with California Department of Transportation standards.

3.05 PLACING ASPHALT PAVEMENT - SINGLE COURSE

A. Install Work in accordance with California Department of Transportation standards.

B. Place asphalt within twenty-four (24) hours of applying primer or tack coat.

C. Place asphalt wearing course as indicated on the Plans.

D. Compact pavement by rolling to specified density. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.

E. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks.

3.06 PLACING ASPHALT PAVEMENT - DOUBLE COURSE

A. Place wearing course within twenty-four (24) hours of placing and compacting binder course. When binder course is placed more than twenty-four (24) hours before placing wearing course, clean surface and apply tack coat before placing wearing course.

B. Compact each course by rolling to specified density. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.

C. Perform rolling with consecutive passes to achieve even and smooth finish, without roller marks.

3.07 TOLERANCES

A. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.

B. Scheduled Compacted Thickness: Within 1/4 inch.

C. Variation from Indicated Elevation: Within 1/4 inch.

3.08 PROTECTION OF FINISHED WORK

A. Immediately after placement, protect pavement from mechanical injury for forty-eight (48) hours or until surface temperature is less than 140 degrees F.

END OF SECTION

SECTION 32 12 36

ASPHALT SLURRY SEAL

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Section Includes:

1. Crack Sealing
2. Asphaltic slurry sealing

1.02 RELATED SECTIONS

A. Section 32 11 23 Aggregate Base Course

B . Section 32 12 16 Asphalt Paving

C. Section 31 21 13 Site Grading

1.03 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

B. Unless otherwise noted, standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes as of the date of issue of this Project Manual.

C. Referenced Standards:

1. CalTrans Standard Specifications. Refer Sections 37-4 and 37-5.

2. City of Stockton Standard Specifications

3. American Association of State Highway and Transportation Officials:

1.04 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Asphalt Slurry Seal:

1. Basis of Measurement: By square yard.

2. Basis of Payment: Includes all work outlined in this section.

3. Includes work associated with any crack sealing that is needed prior to slurry seal application.

1.05 SUBMITTALS

A. Crack Sealing Product: If your selected crack treatment material is on the Authorized Material List for flexible pavement crack treatment material, submit a certificate of compliance including:

1. Manufacturer's name
2. Production location
3. Brand or trade name
4. Designation
5. Batch or lot number
6. Crack treatment material type
7. Contractor or subcontractor name
8. Contract number
9. Lot size
10. Shipment date
11. Manufacturer’s signature

If your selected crack treatment material is not on the Authorized Material List, submit a sample and test results from each batch or lot 20 days before use. Testing must be performed by an authorized laboratory, and test results must show compliance with the specifications. Test reports must include the information specified for the certificate of compliance submittal. Each hot-applied crack treatment material sample must be a minimum of 3 lb and submitted in a silicone release container. Each cold-applied crack treatment material sample must be a minimum of 2 qt and submitted in a plastic container.

Submit the following with each delivery of crack treatment material to the job site:

1. Manufacturer’s heating and application instructions
2. Manufacturer's SDS
3. Name of the manufacturer's recommended detackifying agent

B. Slurry Seal Product Data: Submit product information and mix design.

1. At least 15 days before starting placement, submit samples of the aggregate to be used. The samples must be processed the same way as the aggregate to be used in the work.

2. At least 10 days before starting placement, submit the name of a laboratory to perform testing and mix design.

3. At least 10 days before starting placement, submit a laboratory report of test results and a proposed mix design. The report and mix design must include the specific materials to be used and show a comparison of test results and specifications. The mix design report must include the quantity of water allowed to be added at the job site. The laboratory performing the tests must sign the original laboratory report and mix design.

4. If the mix design consists of the same materials covered by a previous laboratory report, you may submit the previous laboratory report which must include material testing data performed within the previous 12 months for authorization.

5. If you request substitute materials, submit a new laboratory report and mix design at least 10 days before starting placement.

6. At least 10 days before use, submit the manufacturer's data for oil seal primer and polymer.

7. Submit a certificate of compliance for the parking area seal material.

1.06 QUALITY ASSURANCE

A. Perform Work in accordance with California Department of Transportation Public Work's standards.

B. Mixing Plant: Conform to California Department of Transportation Public Work's standards.

C. Obtain materials from same source throughout.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Do not place parking area seal when the ambient temperature is less than 55 degrees F or the surface temperature is less than 60 degrees F. Do not place seal within 24 hours of rain or within 24 hours of forecast rain or freezing temperatures. Request that the Engineer shut off the irrigation control system at least 5 days before placing the seal and keep it shut off at least 24 hours after the seal coat placement. Add polymer at the job site in the Engineer's presence.

PART 2 - PRODUCTS

2.01 MATERIALS

A. The crack treatment material shall comply with the requirements in the following table:

Crack Treatment Material

Quality characteristic[a]	Test method	Requirement				
		Type 1	Type 2	Type 3	Type 4	Type 5
Softening point (min, °C)	ASTM D36/D36M	102	96	90	84	84
Cone penetration at 77 °F (max)	ASTM D5329	35	40	50	70	90
Resilience at 77 °F, unaged (%)	ASTM D5329	20—60	25—65	30—70	35—75	40—80
Flexibility °(°C)	ASTM D3111	0	0	0	-11	-28
Tensile adhesion (min, %)	ASTM D5329	300	400	400	500	500
Specific gravity (max)	ASTM D70	1.25	1.25	1.25	1.25	1.25
Asphalt compatibility	ASTM D5329	Pass	Pass	Pass	Pass	Pass

Sieve test (% passing)	See note d	100	100	100	100	100

[a]Cold-applied crack treatment material residue collected under ASTM D6943, Method B and sampled under ASTM D140 must comply with the grade specifications.
[b]Except for viscosity, cure each specimen at a temperature of 23 + 2 °C and a relative humidity of 50 + 10 percent for 24 + 2 hours before testing.
[c]For the flexibility test, the specimen size must be 6.4 + 0.2 mm thick by 25 + 0.2 mm wide by 150 + 0.5 mm long. The test mandrel diameter must be 6.4 :t 0.2 mm. The bend arc must be 180 degrees. The bend rate must be 2 + 1 seconds. At least 4 of 5 test specimens must pass at the specified test temperature without fracture, crazing, or cracking.
[d]For hot-applied crack treatment, dilute with toluene and sieve through a no. 8 sieve. For cold-applied crack treatment, sieve the material as-received through a no. 8 sieve. If the manufacturer provides a statement that added components passed the no. 16 sieve before blending, this requirement is void.

Crack treatment material must be delivered to the job site with the information listed below. If crack treatment material is delivered to the job site in containers, each container must be marked with the following information.

1. Manufacturer's name
2. Production location
3. Brand or trade name
4. Designation
5. Crack treatment trade name
6. Batch or lot number
7. Maximum heating temperature
8. Expiration date for cold application only

Hot-applied crack treatment must be delivered to the job site premixed in cardboard containers with meltable inclusion liners or in a fully meltable package.

Cold-applied crack treatment must have a minimum shelf life of 3 months from the date of manufacture.

Sand applied to tacky crack treatment material must be clean, free of clay, and comply with the gradation shown in the following table:

Sand Gradation

Sieve Size	Percent Passing
No. 4	100
No. 50	0-30
No. 200	0-5

B. Asphalt Slurry Seal

1. Aggregate must be clean, hard, durable, uncoated, and free from organic and deleterious substances. One hundred percent of the aggregate must pass the no. 16 sieve.
2. Asphaltic emulsion must be either Grade SS1h or CSS1h, except the values for penetration at 25 degrees C for tests on residue from distillation must be from 20 to 60. You may use clay-stabilized emulsion with a solids content not less than 45 percent by weight.
3. Polymer must be either neoprene, ethylene vinyl acetate, or a blend of butadiene and styrene.
4. Oil seal primer must be a quick-drying emulsion with admixtures. Oil seal primer must be manufactured to isolate the parking area slurry seal from pavement with residual oils, petroleum grease, and spilled gasoline.
5. Crack sealant must comply with section 37-5.

6. Water must be potable and not separate from the emulsion before the material is placed.

The proposed mix design for parking area seals must comply with the requirements shown in the following table:

Parking Area Seal Design Mix Requirements

Quality Characteristic	Test Method	Requirement
Mass per liter (min, kg)	ASTM D244	1.1
Cone penetration (mm)	California Test 413	340-700
Nonvolatile (min, %) Nonvolatile soluble in tri-clorethylene (%)	ASTM D2042[a]	50 10-35
Wet track abrasion (max, g/m2)	ASTM D3910	380
Dried film color	-	Black
Viscosity (min, KU[b])	ASTM D562	75

[a]Weigh 10 g of homogenous material into a previously tared, small ointment can. Place in a constant temperature oven at 165 + 5 °C for 90 + 3 minutes. Cool, reweigh, and calculate non-volatile components as a percent of the original weight.

[b]Krebs units

Parking area seals must contain a minimum of 2 percent polymer by volume of undiluted asphaltic emulsion.

PART 3 - EXECUTION

3.01 CRACK TREATMENT

A. Treat cracks for the entire length of the crack. Fill or repair cracks wider than 1 inch as ordered.

3.02 SURFACE PREPARATION

A. Before applying seal coat, cover manholes, valve and monument covers, grates, or other exposed facilities located within the area of application with plastic or oil-resistant construction paper secured by tape or adhesive to the facility being covered.

B. Reference the covered facilities with enough control points to locate the facilities after the application of the seal coat. After completion of seal coat activities, remove covers from the facilities.

C. Immediately before applying seal coat, clean the surface to receive seal coat by removing extraneous material and drying. Use brooms to clean the existing pavement.

3.03 PLACING

A. Add polymer at the job site in the Engineer's presence.

B. If adding water at the job site based on the manufacturer's instructions for consistency and spreadability, do not exceed 15 percent by volume of undiluted asphaltic emulsion.

C. Before placing the parking area seal, dampen the pavement surface using a distributor truck. Place the seal on the damp pavement but do not place it with standing water on the pavement.

D. Place the parking area seal in 1 or more application. The seal must be uniform and smooth, free of ridges or uncoated areas.

E. If placing in multiple applications, allow the last application to thoroughly dry before the subsequent application.

F. Do not allow traffic on the parking area seal for at least 24 hours after placement. Do not stripe the parking area seal until it is dry.

END OF SECTION

SECTION 32 13 13

CONCRETE PAVING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Cast-in-place concrete, Concrete Paving for roads, parking areas, and side-walks, as well as curbs, gutters and valley gutters. The work will also cover cast in place retaining walls.

B. Related Sections. See Related Sections for additional requirements applicable to this Section (typical).

1. Section 32 11 23 – Aggregate Base Course.

2. Section 31 21 13 – Site Grading.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field.

2. ASTM C33 - Standard Specification for Concrete Aggregates.

3. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

4. ASTM C42 - Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.

5. ASTM C94 - Standard Specification for Ready-Mixed Concrete.

6. ASTM C143 - Standard Test Method for Slump of Hydraulic Cement Concrete.

7. ASTM C150 - Standard Specification for Portland Cement.

8. ASTM C157 - Standard Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete.

9. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete.

10. ASTM C173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.

11. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.

12. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.

13. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

14. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete.

15. ASTM C596 - Standard Test Method for Drying Shrinkage of Mortar Containing Hydraulic Cement.

16. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.

B. American Concrete Institute (ACI):

1. ACI 304R - Guide for Measuring, Mixing, Transporting and Placing Concrete.

2. ACI 305R - Hot Weather Concreting.

3. ACI 306.1 - Standard Specification for Cold Weather Concreting.

4. ACI 318 - Building Code Requirements for Structural Concrete.

5. ACI 350 - Code Requirements for Environmental Engineering Concrete Structures.

C. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.03 SUBMITTALS

A. Product Data: Submit to the Engineer, in accordance with Section 01 33 00, product data including the following:

1. Sources of cement, pozzolan, and aggregates.

2. Material Safety Data Sheets (MSDS) for all concrete components and admixtures.

3. Air-entraining admixture. Product data including catalogue cut, technical data, storage requirements, product life, recommended dosage, temperature considerations and conformity to ASTM standards.

4. Water-reducing admixture. Product data including catalogue cut, technical data, storage requirements, product life, recommended dosage, temperature considerations and conformity to ASTM standards.

5. High-range water-reducing admixture (superplasticizer). Product data including catalogue cut, technical data, storage requirements, product life, recommended dosage, temperature considerations, retarding effect, slump range and conformity to ASTM standards. Identify proposed locations of use.

6. Concrete mix design for each formulation of concrete proposed for use including constituent quantities per cubic yard, water-cementitious materials ratio, concrete slump, type and manufacturer of cement. See also the required test reports and certifications listed below. Provide either (a) or (b) below for each mix design proposed.

a. Compression test results for proposed mixes. Include standard deviation data for each proposed concrete mix based on statistical records.

b. The curve of water-cementitious materials ratio versus concrete cylinder strength for each formulation of concrete proposed based on laboratory tests. The cylinder strength shall be the average of the 28 day cylinder strength test results for each mix. Provide results of 7 and 14 day tests if available.

7. Sheet curing material. Product data including catalogue cut, technical data and conformity to ASTM C171 standard.

8. Liquid curing compound. Product data including catalogue cut, technical data, storage requirements, product life, application rate and conformity to ASTM C309 standard. Identify proposed locations of use.

B. Samples

1. Fine and coarse aggregates if requested by the Engineer.

C. Quality Assurance/Control

1. Test Reports

a. Fine aggregates - sieve analysis, physical properties, and deleterious substance.

b. Coarse aggregates - sieve analysis, physical properties, and deleterious substances.

c. Cements - chemical analysis and physical properties for each type.

d. Pozzolans - chemical analysis and physical properties.

e. Proposed concrete mixes - compressive strength, slump, shrinkage, and air content.

2. Certifications

a. Certify admixtures used in the same concrete mix are compatible with each other and the aggregates.

b. Certify admixtures are suitable for use in contact with potable water after 30 days of concrete curing.

c. Certify curing compound is suitable for use in contact with potable water after 30 days (non-toxic and free of taste or odor).

3. Work Plans

a. Hot weather concreting.

1.04 QUALITY ASSURANCE

A. Reinforced concrete shall comply with ACI 318, ACI 350 and other stated requirements, codes and standards. The most stringent requirement of the codes, standards and this Section shall apply when conflicts exist.

B. Only one source of cement and aggregates shall be used on any one structure. Concrete shall be uniform in color and appearance.

C. Concrete meeting: A meeting will be held between the Engineer and the Contractor to review the detailed requirements of the Contractor's proposed concrete design mixes and to determine the

procedures for producing proper concrete construction. The meeting shall be held no later than 30 days prior to the first concrete placement. All parties involved in concrete work shall attend the conference including the following:

1. Contractor's superintendent and/or project manager;

2. Contractor's concrete supplier testing laboratory representative (optional as determined by the Engineer);

3. Concrete subcontractor;

4. Reinforcing steel subcontractor and detailer;

5. Concrete supplier;

6. Admixture manufacturer's representative(s).

   Meeting discussion topics will include, but not be limited to: methods of hot and cold weather concrete placement, concrete placement during rainy weather, cleanliness of rebar before placement of concrete, concrete mix design(s) and source of concrete materials, concrete shrinkage for key structures, waterstop placement, use of admixtures, concrete curing methods, concrete finishes, grouts, and rebar submittals.

D. If, during the progress of the work, it is impossible to secure concrete of the required workability and strength with the materials being furnished, the Engineer may order such changes in proportions or materials, or both, as may be necessary to secure the desired properties. All changes so ordered shall be made at no additional cost to the Owner.

E. If, during the progress of the work, the materials from the sources originally accepted change in characteristics, the Contractor shall, at no additional cost to the Owner, make new acceptance tests of aggregates and establish new design mixes.

F. Testing of the following materials shall be furnished by Contractor to verify conformity with this Specification Section and the stated ASTM Standards.

1. Fine aggregates for conformity with ASTM C33 - sieve analysis, physical properties, and deleterious substances.

2. Coarse aggregates for conformity with ASTM C33 - sieve analysis, physical properties, and deleterious substances.

3. Cements for conformity with ASTM C150 - chemical analysis and physical properties.

4. Pozzolans for conformity with ASTM C618 - chemical analysis and physical properties.

5. Proposed concrete mix designs - compressive strength, slump, shrinkage, and air content.

G. Field testing and inspection services will be provided by the Owner. The cost of such work, except as specifically stated otherwise, will be paid by the Owner. The Contractor shall be responsible for the cleanup and disposal of testing waste at the project site. Testing of the following items shall be by the Owner to verify conformity with this Specification Section.

1. Concrete placements - compressive strength (cylinders), compressive strength (cores), slump, air content, and shrinkage.

2. Other materials or products that may come under question.

H. All materials incorporated in the work shall conform to accepted samples and test reports.

1.05 DELIVERY, STORAGE AND HANDLING

A. Cement: Store in watertight buildings, bins or silos to provide protection from dampness and contamination and to minimize warehouse set.

B. Aggregate: Arrange and use stockpiles in bunkers or other physical structures to avoid excessive segregation or contamination with other materials or with other sizes of like aggregates. Build stockpiles in successive horizontal layers not exceeding 3-ft in thickness. Complete each layer before the next is started. Do not use frozen or partially frozen aggregate.

C. Sand: Arrange and use stockpiles in bunkers or other physical structures to avoid contamination. Allow sand to drain to a uniform moisture content before using. Do not use frozen or partially frozen aggregates.

D. Admixtures: Store in closed containers to avoid contamination, evaporation or damage. Provide suitable agitating equipment to assure uniform dispersion of ingredients in admixture solutions which tend to separate. Protect liquid admixtures from freezing and other temperature changes which could adversely affect their characteristics.

E. Pozzolan: Store in watertight buildings, bins or silos to provide protection from dampness and contamination.

F. Sheet Curing Materials: Store in watertight buildings or off the ground and under cover.

G. Liquid Curing Compounds: Store in closed containers.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General

1. The use of manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configuration required.

2. Like items of materials shall be the end products of one manufacturer in order to provide standardization for appearance, maintenance and manufacturer's service.

3. Materials shall comply with this Section and any applicable State or local requirements.

B. Cement: Domestic Portland cement complying with ASTM C150. Air entraining cements shall not be used. Cement brand shall be subject to approval by the Engineer and one brand shall be used on any one structure. The following cement type(s) shall be used:

1. Class A and Class B Concrete - Type II with the equivalent alkalies, as defined in Table 2 of ASTM C150, limited to a maximum of a 0.60% (low-alkali cement).

2. Class D Concrete - Type II, low-alkali cement with fly ash resulting in C_3A being below 8 percent of total cementitious content.

C. Fine Aggregate: Washed inert natural sand conforming to the requirements of ASTM C33.

D. Coarse Aggregate: Well-graded crushed stone or washed gravel conforming to the requirements of ASTM C33. Grading requirements shall be as listed in ASTM C33 Table 2 for the specified coarse aggregate size number. Limits of Deleterious Substances and Physical Property Requirements shall be as listed in ASTM C33 Table 3 for severe weathering regions. Size numbers for the concrete mixes shall be as shown in Table 32 13 13-1 herein.

E. Water: Potable water free from injurious amounts of oils, acids, alkalis, salts, organic matter, or other deleterious substances.

F. Admixtures: Admixtures shall be free of chlorides and alkalis (except for those attributable to water). When it is required to use more than one admixture in a concrete mix, the admixtures shall be from the same manufacturer. Admixtures shall be compatible with the concrete mix including other admixtures and shall be suitable for use in contact with potable water after 30 days of concrete curing.

1. Air-Entraining Admixture: The admixture shall comply with ASTM C260. Proportioning and mixing shall be in accordance with manufacturer's recommendations.

2. Water-Reducing Agent: The admixture shall comply with ASTM C494, Type A. Proportioning and mixing shall be in accordance with manufacturer's recommendations.

3. High-Range Water-Reducer (Superplasticizer): The admixture shall comply with ASTM C494, Type F and shall result in non-segregating plasticized concrete with little bleeding and with the physical properties of low water/cement ratio concrete. The treated concrete shall be capable of maintaining its plastic state in excess of 2 hours. Proportioning and mixing shall be in accordance with manufacturer's recommendations.

4. Admixtures causing retarded or accelerated setting of concrete shall not be used without written approval from the Engineer. When allowed, the admixtures shall combine retarding or accelerating with water reducing or high range water reducing admixtures.

G. Pozzolan (Fly Ash). Pozzolan shall be Class C or Class F fly ash complying with ASTM C618 except the Loss on Ignition (LOI) shall be limited to 3 percent maximum.

H. Sheet Curing Materials. Waterproof paper, polyethylene film or white burlap-polyethylene sheeting all complying with ASTM C171.

I. Liquid Curing Compound. Liquid membrane-forming curing compound shall comply with the requirements of ASTM C309, Type 1-D (clear or translucent with fugitive dye) and shall contain no wax, paraffin, or oil. Curing compound shall be approved for use in contact with potable water after 30 days (non-toxic and free of taste or odor).

2.02 MIXES

A. Measuring Materials

1. Concrete shall be composed of Portland cement, fine aggregate, coarse aggregate, water and admixtures as specified and shall be produced by a plant acceptable to the Engineer. All constituents, including admixtures, shall be batched at the plant except a high-range water-reducer may also be added in the field.

2. Measure materials for batching concrete by weighing in conformity with and within the tolerances given in ASTM C94 and ACI 304R except as otherwise specified. Scales shall have been certified by the local Sealer of Weights and Measures within 1 year of use.

3. Measure the amount of free water in fine aggregates within 0.3 percent with a moisture meter. Compensate for varying moisture contents of fine aggregates. Record the number of gallons of water as-batched on printed batching tickets.

4. Admixtures shall be dispensed either manually using calibrated containers or measuring tanks, or by means of an automatic dispenser approved by the manufacturer of the specific admixture.

    a. Charge air-entraining and chemical admixtures into the mixer as a solution using an automatic dispenser or similar metering device.

    b. Inject multiple admixtures separately during the batching sequence.

B. Mix Design

1. Development of mix designs and testing shall be by an independent testing laboratory acceptable to the Engineer and engaged by the Contractor at no additional cost to the Owner.

2. Select proportions of ingredients to meet the design strength and materials limits specified in Table 32 13 13-1 and to produce concrete having proper placability, durability, strength, appearance and other required properties. Proportion ingredients to produce a homogenous mixture which will readily work into corners and angles of forms and around reinforcement without permitting materials to segregate or allowing excessive free water to collect on the surface.

3. The design mix shall be based on one of the following:

    a. Standard deviation shall be based on the modification factors for standard deviation tests contained in ACI 318.

    b. Trial mixtures developed by the design mix shall be based on standard deviation data of prior mixes with essentially the same proportions of the same constituents or, if such data is not available, be developed by a testing laboratory engaged by the Contractor and at no additional cost to the Owner.

    The water content of the concrete mix, determined by laboratory testing, shall be based on a curve showing the relation between water cementitious ratio and 7 and 28 day compressive strengths of concrete made using the proposed materials. The curves shall be determined by four or more points, each representing an average value of at least three test specimens at each age. The curves shall have a range of values sufficient to yield the desired data, including the specified design strengths as modified below, without extrapolation. The water content of the concrete mixes to be used, as determined from the curve, shall correspond to strengths 16 percent greater than the specified design strengths. The resulting mix shall not conflict with the limiting values for maximum water cementitious ratio and net minimum cementitious content as specified in Table 32 13 13-1. Acceptance of mixes based on standard deviation shall be based on the modification factors for standard deviation tests contained in ACI318.

4. Entrained air, as measured by ASTM C231, shall be as shown in Table 32 13 13-1. If the air-entraining agent proposed for use in the mix requires testing methods other than ASTM C231 to accurately determine air content, make special note of this requirement in the admixture submittal.

5. Slump of the concrete as measured by ASTM C143, shall be as shown in Table 32 13 13-1. If a high-range water-reducer (superplasticizer) is used, the slump indicated shall be that

measured before superplasticizer is added. Plasticized concrete shall have a slump ranging from 7 to 10-in.

6. Proportion admixtures according to the manufacturer's recommendations. Two or more admixtures specified may be used in the same mix provided that the admixtures in combination retain full efficiency and have no deleterious effect on the concrete or on the properties of each other.

TABLE 32 13 13-1

CONCRETE MIX REQUIREMENTS

Class	Design Strength (1)	Cement (2)	Fine Aggregate (2)	Coarse Aggregate (3)	Minimum Cementitious Content (4)
A	2500	C150 Type II	C33	57	440
B	3000	C150 Type II	C33	57	480
D	5000	C150 Type II	C33	57	560

Class	W/C Ratio (5)	Fly Ash	AE Range (6)(7)	WR (8)	HRWR (9)	Slump Range Inches
A	0.62 max.	15-20% (10)	3.5 to 5	Yes	No	1-4
B	0.54 max.	15-20% (10)	3.5 to 5	Yes	No	1-3
D	0.44 max.	15-20% (10)	3.5 to 5	Yes	(11)	3-5

NOTES:
(1) Minimum compressive strength in psi at 28 days
(2) ASTM designation
(3) Size Number in ASTM C33
(4) Cementitious content in lbs/cu yd
(5) W/C is Water-Cementitious ratio by weight
(6) AE is percent air-entrainment
(7) AE for concrete slabs may be less than 3 percent
(8) WR is water-reducer admixture
(9) HRWR is high-range water-reducer admixture
(10) Percentage of the total cement plus pozzolan content, by weight
(11) HRWR is required at walls taller than 20 feet and optional at others

C. Mixing and Transporting

1. Concrete shall be ready-mixed concrete. No hand-mixing will be permitted. Clean each transit mix truck drum and reverse drum rotation before the truck proceeds under the batching plant. Equip each transit-mix truck with a continuous, nonreversible, revolution counter showing the number of revolutions.

2. Ready-mix concrete shall be transported to the site in watertight agitator or mixer trucks loaded not in excess of their rated capacities as stated on the name plate.

3. Keep the water tank valve on each transit truck locked at all times. Any addition of water must be approved by the Engineer. Added water shall be incorporated by additional mixing of at least 35 revolutions. All added water shall be metered and the amount of water added shall be shown on each delivery ticket.

4. All central plant and rolling stock equipment and methods shall comply with ACI 318, ACI 304R and ASTM C94.

5. Select equipment of size and design to ensure continuous flow of concrete at the delivery end. Metal or metal-lined non-aluminum discharge chutes shall be used and shall have slopes not exceeding 1 vertical to 2 horizontal and not less than 1 vertical to 3 horizontal. Chutes more than 20-ft long and chutes not meeting slope requirements may be used if concrete is discharged into a hopper before distribution.

6. Retempering (mixing with or without additional cement, aggregate, or water) of concrete or mortar which has reached initial set will not be permitted.

7. Handle concrete from mixer to placement as quickly as practicable while providing concrete of required quality in the placement area. Dispatch trucks from the batching plant so they arrive at the work site just before the concrete is required, thus avoiding excessive mixing of concrete.

8. Furnish a delivery ticket for ready mixed concrete to the Engineer as each truck arrives. Each ticket shall provide a printed record of the weight of cement and each aggregate as batched individually. Use the type of indicator that returns for zero punch or returns to zero after a batch is discharged. Clearly indicate the weight of fine and coarse aggregate, cement and water in each batch, the quantity delivered, the time any water is added, and the numerical sequence of the delivery. Show the time of day batched and time of discharge from the truck. Indicate the number of revolutions of the truck mixer. Annotate each delivery ticket with the structure and component where the concrete was placed.

9. Temperature and Mixing Time Control

    a. In cold weather, do not allow the as-mixed temperature of the concrete and concrete temperatures at the time of placement in the forms to drop below 40 degrees F.

    b. If water or aggregate has been heated, combine water with aggregate in the mixer before cement is added. Do not add cement to mixtures of water and aggregate when the temperature of the mixture is greater than 90 degrees F.

    c. In hot weather, cool ingredients before mixing to maintain temperature of the concrete below the maximum placing temperature of 90 degrees F. If necessary, substitute well-crushed ice for all or part of the mixing water.

    d. The maximum time interval between the addition of mixing water and/or cement to the batch and the placing of concrete in the forms shall not exceed the values shown in Table 32 13 13-2.

TABLE 032 13 13-2

MAXIMUM TIME TO DISCHARGE OF CONCRETE

Air or Concrete Temperature (whichever is higher)	Maximum Time
Above 90 Degree F (32 Degree C) (Note 1)	60 minutes
80 to 90 Degree F (27 to 32 Degree C)	60 minutes
70 to 79 Degree F (21 to 26 Degree C)	60 minutes
40 to 69 Degree F (5 to 20 Degree C)	90 minutes

Note 1: In air temperatures above 90 degrees F, the temperature of concrete being placed shall not exceed 90 degrees F.

If an approved high-range water-reducer (superplasticizer) is used to produce plasticized concrete, the maximum time interval shall not exceed 90 minutes.

D. Concrete Appearance

1. Concrete mix showing either poor cohesion or poor coating of the coarse aggregate with paste shall be remixed. If this does not correct the condition, the concrete shall be rejected. If the slump is within the allowable limit, but excessive bleeding, poor workability, or poor finishability are observed, changes in the concrete mix shall be obtained only by adjusting one or more of the following:

   a. The gradation of aggregate.

   b. The proportion of fine and coarse aggregate.

   c. The percentage of entrained air, within the allowable limits.

2. Concrete for the work shall provide a homogeneous structure which, when hardened, will have the required strength, durability and appearance. Mixtures and workmanship shall be such that concrete surfaces, when exposed, will require no finishing. When concrete surfaces are stripped, the concrete, when viewed in good lighting from 10-ft away, shall be pleasing in appearance, and at 20-ft shall show no visible defects.

2.03 SOURCE QUALITY CONTROL

A. Compression Tests: Provide testing of the proposed concrete mix or mixes to demonstrate compliance with the specified design strength requirements in conformity with Section 2.02B.

B. Shrinkage Tests: Perform shrinkage tests on the design mix for Class D concrete. All specimens shall be cast in the laboratory. Concrete and not mortar specimens shall be used. The tests shall conform to ASTM C157 modified as follows:

1. Three 4”x4”x11” test specimens with 10” gage length shall be made.

2. Specimens shall be removed from molds at an age of 23$\pm$1 hours after trial batching, and placed immediately in water at 73^{o}F$\pm$3^{o} for at least 30 minutes.

3. Specimens shall be measured 30 minutes thereafter to determine the original length, and then submerged in saturated lime water at 73°F±3°.

4. Measurement to determine expansion expressed as a percentage of original length shall be made at age 7 days. The length at 7 days shall be made the base length for drying shrinkage calculations.

5. Specimens shall be stored in a humidity control room maintained at 73°F±3° and 50%±4% relative humidity for the remainder of the test.

6. Measurements to determine shrinkage expressed as a percentage of base length shall be made and reported separately for 7, 14, and 21 days of drying after 7 days of moist curing.

7. The average shrinkage at 21 days of air storage shall not exceed 0.040 percent.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Placing

1. The class of concrete shall be per Table 32 13 13-3 or as shown on the Drawings. Place all concrete in accordance with the recommendations contained in ACI304R. Concrete shall not be placed when rainfall (or forecast rainfall) is sufficient to cause damage to the work. Concrete placement in progress shall be stopped when rainfall occurs unless the concrete is completely protected from rainfall damage. Verify that all formwork completely encloses concrete to be placed and is securely braced prior to concrete placement. Remove ice, excess water, dirt and other foreign materials from forms. Confirm that reinforcement and other embedded items are securely in place. Have competent workers at the location of the placement. Workers shall be able to ensure that reinforcing steel and embedded items remain in designated locations while concrete is being placed. Sprinkle semi-porous subgrades or forms to eliminate suction of water from the mix. Seal extremely porous subgrades in an approved manner.

2. Deposit concrete as near its final position as possible to avoid segregation due to rehandling or flowing. Place concrete continuously at a rate which ensures the concrete is being integrated with fresh plastic concrete. Do not deposit concrete which has partially hardened or has been contaminated by foreign materials or on concrete which has hardened sufficiently to cause formation of seams or planes of weakness within the section. If the section cannot be placed continuously, place construction joints as specified or as approved.

3. Pumping of concrete will be permitted. Use a mix design and aggregate sizes suitable for pumping and submit for approval.

4. Remove temporary spreaders from forms when the spreader is no longer useful. Temporary spreaders may remain embedded in concrete only if it is a non-water containing structure, when made of galvanized metal or concrete, and only if prior approval from the Engineer has been obtained.

5. Do not place concrete for supported elements until concrete previously placed in the supporting element (columns, slabs and/or walls) has reached adequate strength.

6. Where surface mortar is to form the base of a finish, especially surfaces designated to be painted, work coarse aggregate back from forms with a suitable tool to bring the full surface of the mortar against the form. Prevent the formation of excessive surface voids.

7. Slabs

    a. After suitable bulkheads, screeds and jointing materials have been positioned, the concrete shall be placed continuously between construction joints beginning at a bulkhead, edge form, or corner. Each batch shall be placed into the edge of the previously placed concrete to avoid stone pockets and segregation.

    b. Avoid delays in casting. If there is a delay in casting, the concrete placed after the delay shall be thoroughly spaded and consolidated at the edge of that previously placed to avoid cold joints. Concrete shall then be brought to correct level and struck off with a straightedge. Bullfloats or darbies shall be used to smooth the surface, leaving it free of humps or hollows.

    c. Where slabs are to be placed integrally with the walls below them, place the walls and compact as specified. Allow 1 hour to pass between placement of the wall and the overlying slab to permit consolidation of the wall concrete. Keep the top surface of the wall moist so as to prevent cold joints.

8. Formed Concrete

    a. Place concrete in forms using tremie tubes and taking care to prevent segregation. Bottom of tremie tubes shall preferably be in contact with the concrete already placed. Do not permit concrete to drop freely more than 4-ft. Place concrete for walls in 12 to 24-in lifts, keeping the surface horizontal. If plasticized concrete is used, the maximum lift thickness may be increased to 4-ft and the maximum free fall of concrete shall not exceed 4-ft.

    b. A minimum of 48 hours shall have elapsed between casting of adjacent wall sections at a vertical construction joint.

B. Compacting

1. Consolidate concrete by vibration, puddling, spading, rodding or forking so that concrete is thoroughly worked around reinforcement, embedded items and openings and into corners of forms. Puddling, spading, etc, shall be continuously performed along with vibration of the placement to eliminate air or stone pockets which may cause honeycombing, pitting or planes of weakness.

2. All concrete shall be placed and compacted with mechanical vibrators. One vibrator shall be used for each 8 c.y. placed per hour. The type and size of the units shall be approved by the Engineer in advance of placing operations. No concrete shall be ordered until sufficient approved vibrators (including standby units in working order) are on the job.

3. A minimum frequency of 7000 rpm is required for mechanical vibrators. Insert and withdraw vibrators vertically at points from 18 to 30-in apart. At each insertion, vibrate sufficiently to consolidate concrete, generally from 5 to 15 seconds. Do not segregate concrete through overvibration. Keep a spare vibrator on the site during concrete placing operations.

4. Concrete Slabs: Concrete for slabs less than 8-in thick shall be consolidated with vibrating screeds; slabs 8-in and thicker shall be compacted with internal vibrators and (optionally)

with vibrating screeds. Vibrators shall always be placed into concrete vertically and shall not be laid horizontally or laid over.

5. Walls and Columns: Internal vibrators (rather than form vibrators) shall be used unless otherwise approved by the Engineer. In general, for each vibrator needed to melt down the batch at the point of discharge, one or more additional vibrators must be used to densify, homogenize and perfect the surface. The vibrators shall be inserted vertically at regular intervals, through the fresh concrete and slightly into the previous lift, if any.

6. Amount of Vibration: Vibrators are to be used to consolidate properly placed concrete but shall not be used to move or transport concrete in the forms. Vibration shall continue until:

   a. Frequency returns to normal.

   b. Surface appears liquefied, flattened and glistening.

   c. Trapped air ceases to rise.

   d. Coarse aggregate has blended into surface, but has not disappeared.

C. Curing

1. Protect all concrete work against injury from the elements and defacements of any nature during construction operations.

2. Curing Methods

   a. Curing Methods for Concrete Surfaces: Cure concrete to retain moisture and maintain specified temperature at the surface for a minimum of 7 days after placement. Curing methods to be used are as follows:

      1) Water Curing: Keep entire concrete surface wet by ponding, continuous sprinkling or covered with saturated burlap. Begin wet cure as soon as concrete attains an initial set and maintain wet cure 24 hours a day.
      2) Sheet Material Curing: Cover entire surface with sheet material. Securely anchor sheeting to prevent wind and air from lifting the sheeting or entrapping air under the sheet. Place and secure sheet as soon as initial concrete set occurs.
      3) Liquid Membrane Curing: Apply over the entire concrete surface except for surfaces to receive additional concrete. Curing compound shall NOT be placed on any concrete surface where additional concrete is to be placed, where concrete sealers or surface coatings are to be used, or where the concrete finish requires an integral floor product. Curing compound shall be applied as soon as the free water on the surface has disappeared and no water sheen is visible, but not after the concrete is dry or when the curing compound can be absorbed into the concrete. Application shall be in compliance with the manufacturer's recommendations.

   b. Specified Applications of Curing Methods.

      1) Slabs for Water Containment Structures: Water curing only.
      2) Slabs on Grade and Footings (not used to contain water): Water curing, sheet material curing or liquid membrane curing.
      3) Structural Slabs (other than water containment): Water curing or liquid membrane curing.
      4) Horizontal Surfaces which will Receive Additional Concrete, Coatings, Grout or Other Material that Requires Bond to the substrate: Water curing.

5) Formed Surfaces: None if nonabsorbent forms are left in place 7 days. Water cure if absorbent forms are used. Sheet cured or liquid membrane cured if forms are removed prior to 7 days. Exposed horizontal surfaces of formed walls or columns shall be water cured for 7 days or until next placement of concrete is made.
6) Concrete Joints: Water cured or sheet material cured.

3. Finished surfaces and slabs shall be protected from the direct rays of the sun to prevent checking and crazing.

D. Cold Weather Concreting:

1. "Cold weather" is defined as a period when for more than 3 successive days, the average daily outdoor temperature drops below 40 degrees F. The average daily temperature shall be calculated as the average of the highest and the lowest temperature during the period from midnight to midnight.

2. Cold weather concreting shall conform to ACI 306.1 and the additional requirements specified herein. Temperatures at the concrete placement shall be recorded at 12 hour intervals (minimum).

3. The Contractor shall discuss a cold weather work plan with the Engineer. The discussion shall encompass the methods and procedures proposed for use during cold weather including the production, transportation, placement, protection, curing and temperature monitoring of the concrete. The procedures to be implemented upon abrupt changes in weather conditions or equipment failures shall also be discussed. Cold weather concreting shall not begin until the work plan is acceptable to the Engineer.

4. During periods of cold weather, concrete shall be protected to provide continuous warm, moist curing (with supplementary heat when required) for a total of at least 350 degree-days of curing.

a. Degree-days are defined as the total number of 24 hour periods multiplied by the weighted average daily air temperature at the surface of the concrete (e.g.: 5 days at an average 70 degrees F = 350 degree-days).

b. To calculate the weighted average daily air temperature, sum hourly measurements of the air temperature in the shade at the surface of the concrete taking any measurement less than 50 degrees F as 0 degrees F. Divide the sum thus calculated by 24 to obtain the weighted average temperature for that day.

5. Salt, manure or other chemicals shall not be used for protection.

6. The protection period for concrete being water cured shall not be terminated during cold weather until at least 24 hours after water curing has been terminated.

E. Hot Weather Concreting

1. "Hot weather" is defined as any combination of high air temperatures, low relative humidity and wind velocity which produces a rate of evaporation estimated in accordance with ACI 305R, approaching or exceeding 0.2 lbs/sqft/hr.

2. Concrete placed during hot weather, shall be batched, delivered, placed, cured and protected in compliance with the recommendations of ACI 305R and the additional requirements specified herein.

a. Temperature of concrete being placed shall not exceed 90 degrees F and every effort shall be made to maintain a uniform concrete mix temperature below this level. The temperature of the concrete shall be such that it will cause no difficulties from loss of slump, flash set or cold joints.

b. All necessary precautions shall be taken to promptly deliver, to promptly place the concrete upon its arrival at the job and to provide vibration immediately after placement.

c. The Engineer may require the Contractor to immediately cover plastic concrete with sheet material.

3. The Contractor shall discuss with the Engineer a work plan describing the methods and procedures proposed to use for concrete placement and curing during hot weather periods. Hot weather concreting shall not begin until the work plan is acceptable to the Engineer.

F. Removal of Forms

1. Form and shoring removal shall conform to the requirements specified in these project specifications.

3.02 FIELD QUALITY CONTROL

A. The placing and curing of concrete shall be subject to the inspection of the Special Inspector at all times. The Contractor shall advise the Special Inspector of his/her readiness to proceed at least 2 working days prior to each concrete placement. The Special Inspector will inspect the preparations for concreting including the preparation of previously placed concrete, the reinforcing steel and the alignment, cleanliness and tightness of formwork. No placement shall be made without the inspection and acceptance of the Special Inspector.

B. Sets of field control cylinder specimens will be taken by the Owner (or Inspector) during the progress of the work, in compliance with ASTM C31. The number of sets of concrete test cylinders taken of each class of concrete placed each day shall not be less than one set per day, nor less than one set for each 150 cu yds of concrete nor less than one set for each 5,000 sq ft of surface area for slabs or walls.

1. A "set" of test cylinders consists of five cylinders: one to be tested at 7 days and two to be tested and their strengths averaged at 28 days. The fourth and fifth cylinders may be used for a special test at 3 days or to verify strength after 28 days if 28 day test results are low. Compressive strength tests shall comply with ASTM C39.

2. When the average 28 day compressive strength of the cylinders in any set falls below the specified design strength or below proportional minimum 7 day strengths (where proper relation between seven and 28 day strengths have been established by tests), proportions, water content, or temperature conditions shall be changed by the Contractor to achieve the required strengths.

C. The Contractor shall cooperate in the making of tests by allowing free access to the work for the selection of samples, providing an insulated and closed, wood or metal curing box for specimens, affording protection to the specimens against injury or loss through the Contractor's operations and furnish material and labor required for the purpose of taking concrete cylinder samples. All shipping of specimens will be paid for by the Owner. The cleanup and disposal of test waste shall be the responsibility of the Contractor.

D. Slump tests will be made in the field by the Special Inspector immediately prior to placing the concrete. Such tests shall be made in accordance with ASTM C143. Slump test shall be taken

for each set of test cylinders defined above. If the slump is outside the specified range, the concrete shall be rejected.

E. Air Content: Test for air content shall be made by the Special Inspector on fresh concrete samples. Air content test shall be taken for each set of test cylinders defined above. Air content for concrete made of ordinary aggregates having low absorption shall be made in compliance with either the pressure method complying with ASTM C231 or by the volumetric method complying with ASTM C173.

F. Shrinkage (for concrete in liquid-containing structures)

1. Field test specimens shall be handled and tested by the Special Inspector as specified in Paragraph 2.03B. A set of test cylinders shall be taken from the first batch of concrete and any initial batch thereafter in which the source of concrete ingredients has changed.

2. The maximum concrete shrinkage for specimens cast in the field shall not exceed the trial batch maximum shrinkage requirement by more than 25 percent.

3. If the required shrinkage limitation is not met during construction, the Contractor shall take any or all of the following actions, at no additional cost to the Owner, to achieve the specified shrinkage requirements. These actions may include changing the source of aggregates, cement and/or admixtures; reducing water content; washing of aggregate to reduce fines; increasing the number of construction joints; modifying the curing requirements; or other actions designed to minimize shrinkage or the effects of shrinkage.

G. The Engineer may have cores taken from any questionable area in the concrete work such as construction joints and other locations as required for determination of concrete quality. The results of tests on such cores shall be the basis for acceptance, rejection or determining the continuation of concrete work.

H. The Contractor shall cooperate in obtaining cores by allowing free access to the work and permitting the use of ladders, scaffolding and such incidental equipment as may be required. The Contractor shall repair all core holes. The work of cutting and testing the cores will be at the expense of the Owner.

3.03 ADJUSTING

A. Failure to Meet Requirements

1. Should the strengths shown by the test specimens made and tested in compliance with the previous provisions fall below the values given in Table 32 13 13-1, the Engineer shall have the right to require changes in the mix design to apply to the remainder of the work. Furthermore, the Engineer shall have the right to require additional curing on those portions of the structure represented by the test specimens which failed. The cost of such mix design changes and additional curing shall be at no additional cost to the Owner. In the event that such additional curing does not give the strength required, as evidenced by core and/or load tests, the Engineer shall have the right to require strengthening or replacement of those portions of the structure which fail to develop the required strength. The cost of all such core borings and/or load tests and any strengthening or concrete replacement required because strengths of test specimens are below that specified, shall be entirely at no additional cost to the Owner. In such cases of failure to meet strength requirements the Contractor and Engineer shall confer to determine what adjustment, if any, can be made in compliance with Sections titled "Strength" and "Failure to Meet Strength Requirements" of ASTM C94. The "purchaser" referred to in ASTM C94 is the Contractor in this Section.

2. When the tests on control specimens of concrete fall below the specified strength, the Engineer will permit check tests for strengths to be made by means of typical cores drilled from the structure in compliance with ASTM C42 and C39. In the case of cores not indicating adequate strength, the Engineer, in addition to other recourses, may require, at no additional cost to the Owner, load tests on any one of the slabs, beams, piles, caps, and columns in which such concrete was used. Tests need not be made until concrete has aged 60 days.

3. Should the 28-day strength of test cylinders fall below 60 percent of the required minimum 28 day strength, the concrete shall be rejected and shall be removed and replaced.

B. Patching and Repairs

1. It is the intent of this Section to require quality work including adequate forming, proper mixture and placement of concrete and curing so completed concrete surfaces will require no patching.

2. Defective concrete as determined by the Engineer shall be repaired as specified in at no additional cost to the Owner.

3. As soon as the forms have been stripped and the concrete surfaces exposed, fins and other projections shall be removed; recesses left by the removal of form ties shall be filled; and surface defects which do not impair structural strength shall be repaired. Clean all exposed concrete surfaces and adjoining work stained by leakage of concrete.

4. Immediately after removal of forms, remove plugs and break off metal ties. Promptly fill holes upon stripping as follows: Moisten the hole with water, followed by a 1/16-in brush coat of neat cement slurry mixed to the consistency of a heavy paste. Immediately plug the hole with a 1 to 1.5 mixture of cement and concrete sand mixed slightly damp to the touch (just short of "balling"). Hammer the grout into the hole until dense, and an excess of paste appears on the surface in the form of a spiderweb. Trowel smooth with heavy pressure. Avoid burnishing.

5. When patching exposed surfaces, the same source of cement and sand as used in the parent concrete shall be employed. Adjust color if necessary by addition of proper amounts of white cement. Rub lightly with a fine Carborundum stone at an age of 1 to 5 days if necessary to bring the surface down with the parent concrete. Do not damage or stain the surrounding parent concrete. Wash thoroughly to remove all rubbed matter.

3.04 SCHEDULE

A. The following (Table 32 13 13-3) are the general applications for the various concrete classes and design strengths:

TABLE 32 13 13-3
CONCRETE SCHEDULE

Class	Design Strength (psi)	Description
A	2,500	Concrete fill, duct and pipe encasements, and thrust blocks
B	3,000	Concrete overlay slabs, pavements, sidewalk and curb
D	4,000	Retaining walls, footings, slabs on grade, suspended slab and beam systems, and all other structural concrete

END OF SECTION

SECTION 32 17 23

PAVEMENT MARKINGS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Section Includes painted pavement markings, lines, and legends.

1.02 RELATED SECTIONS

A. Section 32 12 16 Asphalt Paving

1.03 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

B. Unless otherwise noted, standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes as of the date of issue of this Project Manual.

C. Caltrans State Standard Specifications, Latest Edition.

D. M.U.T.C.D California Supplement, Latest Edition

E. CBC - California Building Code, Latest Edition

1.04 SUBMITTALS

A. Product Data: Submit manufacturer’s printed product data on all coatings specified, including preparation and application instructions.

B. Samples:

1. Submit two paper chip samples, 3 inch by 5 in size illustrating range of colors and textures available for each surface finishing product scheduled.

2. Submit two painted samples, illustrating selected colors and textures for each color and system selected. Submit on white card stock, 8 inch by 10 inch in size.

C. Manufacturer’s Installation Instructions: Submit the manufacturer’s current recommended methods of installation, including relevant limitations, safety and environmental cautions, application rates, special surface preparation procedures, and substrate conditions requiring special attention.

D. Manufacturer’s Certificate: Certify Products meet or exceed specified requirements.

1.05 QUALIFICATIONS

A. Manufacturer Company specializing in manufacturing products specified in this section with minimum three (3) years documented experience.

B. Applicator: Company regularly engaged and specializing in the application of pavement markings, with minimum three (3) years documented experience.

C. Regulatory Requirements: Comply with applicable codes and regulations of cognizant governmental agencies having jurisdiction, including those having jurisdiction over airborne emissions and industrial waste disposal. Where those requirements conflict with this Specification, comply with the more stringent provision.

D. Volatile Organic Compounds (VOC): Use only products in compliance with VOC content limits required by state and local regulations.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions. Protect materials from adulteration by infiltration.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Perform the Work of this Section under environmental conditions no less stringent than those stipulated by the manufacturers of the materials used.

1. Take precautions necessary to avoid and mitigate the effects of wind drift in the application of liquid materials.

2. Do not apply marking paint when weather is foggy or rainy, or ambient temperatures are below 40 degrees F, nor when such conditions are anticipated during eight hours after application.

B. Volatile Organic Content (VOC). Do not exceed State or Environmental Protection Agency maximum VOC on traffic paint.

1.08 EXTRA MATERIALS

A. Supply one (1) gallon of each color, type, and surface texture of paint installed. Store where directed.

B. Label each container with color, type, texture, and room locations, in addition to manufacturer's label.

PART 2 - PRODUCTS

2.01 PAINTED PAVEMENT MARKINGS

A. Manufacturers:

1. Dunn-Edwards. Type: W801 Traffic Marking Paint

2. Frazee Industries, Inc. Type: 506 Traffic Line Paint

3. ICI Dulux. Type: 4800 Series Traffic Paint

B. Product Description: Dunn Edwards Vin-L-Stripe Traffic Marking Paint, W80I Series, epoxy modified acrylic latex based, specifically formulated for application to asphalt and concrete vehicular traffic surfaces. Provide paint certifiable by the manufacturer as being in accordance with the California Air Resources Board (CARB) rules in effect at the time of application.

1. Factory mixed, quick drying and non-bleeding.

2. Color

a.	Text	White and Blue as shown on drawings.
b.	Parking divider stripes:	White.
c.	No parking zone markings:	Yellow.
d.	No parking curb:	Red.
e.	Accessible Zone markings:	White and Blue as shown on drawings.
f.	Crosswalk striping:	White.
g.	Directional arrows:	White.
h.	Driving lane dividers:	White.

3. Blue paint for the symbol of accessibility: Match color No. 15090 in Federal Standard 595A as specified in Section 2-1720 of CCR Title 24 Handicap Regulations (similar to Royal Blue).

2.02 EQUIPMENT

A. Pressurized, self-contained paint machine capable of applying a straight line from 2 inches to 6 inches wide, with consistent coverage of a minimum of 150 square feet per gallon.

B. Machine Calibration:

1. Paint Line Measuring Device: Calibrate automatic line length gauges to maintain tolerance of plus or minus 25 feet per mile.

2. Paint Guns: Calibrate to simultaneously apply paint binder at uniform rates as specified with an allowable tolerance of plus or minus 1 mil.

C. Other Equipment

1. For application of crosswalks, intersections stop lines, legends and other miscellaneous items by walk behind stripers, hand spray or stencil trucks, apply with equipment meeting requirements of this section. Do not use hand brushes or rollers.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify surfaces are ready to receive Work as instructed by product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report conditions capable of affecting proper application.

3.02 PREPARATION

A. Maintenance and Protection of Traffic:

1. Provide short term traffic control in accordance with these specifications.

2. Prevent interference with marking operations and to prevent traffic on newly applied markings before markings dry.

3. Maintain travel lanes between 7: 00 AM to 9: 00 AM, and between 4: 00 PM and 6: 00 PM.

4. Maintain access to existing buildings and other properties requiring access.

B. Locate markings as shown on Drawings. Provide qualified technicians to supervise equipment and application of markings. Lay out markings using guidelines, templates and forms. Obtain verification from Architect for confirmation of lay out; colors, and placement of markings.

C. Correct defects and clean surfaces affecting work of this section. Sand all gloss finishes to sheen. Remove existing coatings that are flaking or otherwise in unacceptable condition to receive paint Preparation or removal of coatings containing lead must be performed in accordance with all EPA and OSHA guidelines.

D. Concrete and Masonry Surfaces: Pressure wash to remove all dirt, loose mortar, scale, salts, alkalies, and other detrimental substances. Remove oils and grease with solution of trisodium phosphate; rinse well and allow to dry. Remove all plant growth, including all growth spores and spore residue where designated.

E. Asphalt Concrete: All surfaces must be cleaned free from grease, oil, dirt, mildew, stains and other contaminants that would cause adhesion problems. Remove loose, peeling or chalky paint by high-pressure washing or other appropriate methods. Surfaces must be completely dry before application.

1. Allow asphalt concrete to age for 30 days before starting pavement marking.

3.03 EXISTING WORK

A. Remove existing markings in an acceptable manner. Do not remove existing pavement markings by painting over with blank paint Remove by methods that will cause least damage to pavement structure or pavement surface. Satisfactorily repair any pavement or surface damage caused by removal methods.

B. Clean and repair existing remaining or reinstalled lines and legends.

3.04 APPLICATION

A. Agitate paint for 1-15 minutes prior to application to ensure even distribution of paint pigment.

B. Apply marking paint at rate of one gallon per 150 square feet (equivalent to approximately one gallon for 450 lineal feet of 4 inch wide stripe). Rate can increase to a maximum of 400 square feet per gallon based on conditions of surface to be coated.

C. Apply paint with mechanical equipment:

1. Provide uniform straight edges without overspray.

2. Uniform line width of 4 inches, unless otherwise noted on Drawings.

3. Provide hatching in accessible parking areas as required by Code.

4. Use single line striping between parking stalls.

5. Apply at manufacturer’s recommended rates to provide a minimum wet film thickness of 13 mils.

6. Identify parking spaces with text where shown on drawings.

D. Accessibility Symbol: Apply international accessibility symbol on pavement surface in accordance with CCR Title 24 Section 1129B. The surface of each accessible parking space or stall shall have a surface identification duplicating the following scheme:

1. By outlining a profile view of a wheelchair with occupant in white on blue background. Locate profile view so that it is visible to a traffic enforcement office when vehicle is properly parked in the space. Size: 36 inches high by 36 inches wide.

E. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

F. Prior to applying, mix paint a sufficient length of time to thoroughly mix the pigment and vehicle together, and keep thoroughly agitated during its application.

G. Apply each coat to uniform appearance. Apply each coat of paint slightly darker than preceding coat unless specified otherwise.

H. Apply markings to indicated dimensions at indicated locations.

I. Prevent splattering and over spray when applying markings.

J. Unless material is track free at end of paint application convoy, use traffic cones to protect markings from traffic until track free. When vehicle crosses a marking and tracks it or when splattering or over spray occurs, eradicate affected marking and resultant tracking and apply new markings.

K. Collect and legally dispose of residues from painting operations.

3.05 PROTECTION OF FINISHED WORK

A. Do not permit traffic over the painted striping and pavement markers until the paint has cured.

3.06 APPLICATION TOLERANCES

A. Maximum Variation from Wet Film Thickness: 1 mil.

B. Maximum Variation from Wet Paint Line Width: Plus or minus 1/8 inch.

C. Maximum Variation from Specified Application Temperature: Plus or minus 5 degrees F.

3.07 PROTECTION OF FINISHED WORK

A. Protect painted pavement markings from vehicular and pedestrian traffic until paint is dry and track free. Follow manufacturer's recommendations or use minimum of 30 minutes. Consider barrier cones as satisfactory protection for materials requiring more than 2 minutes dry lime.

3.08 SCHEDULE OF COLORS

A. Stripes between standard parking stalls: White.

B. Stripes between accessible parking stalls: White.

C. No parking zones diagonal striping: White.

D. Accessible pedestrian crosswalks: White.

E. Accessible Parking Curb: Blue.

F. Direction Arrows: White.

G. NO PARKING stenciled letters: White and Blue as shown on drawings.

END OF SECTION

SECTION 32 17 26
TACTILE WARNING SURFACING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Plastic tactile and detectable warning tiles for pedestrian walking surfaces.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete for sidewalks and platforms.

B. Section 32 13 13 - Concrete Paving: Concrete sidewalks.

C. Section 32 17 23 - Pavement Markings.

1.03 REFERENCE STANDARDS

A. 49 CFR 37 - Transportation Services for Individuals with Disabilities (ADA) current edition.

B. AASHTO LRFD - Bridge Design Specifications 2017, with Errata (2018).

C. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.

D. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar 2015.

E. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus 2019.

F. ASTM C501 - Standard Test Method for Relative Resistance to Wear of Unglazed Ceramic Tile by the Taber Abraser 2021.

G. ASTM C903 - Standard Practice for Preparing Refractory Specimens by Cold Gunning 2015, with Editorial Revision (2016).

H. ASTM D2047 - Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine 2017.

I. ASTM D543 - Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents 2020.

J. ASTM D570 - Standard Test Method for Water Absorption of Plastics 1998 (Reapproved 2018).

K. ASTM D638 - Standard Test Method for Tensile Properties of Plastics 2014.

L. ASTM D695 - Standard Test Method for Compressive Properties of Rigid Plastics 2015.

M. ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials 2017.

N. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2021a.

O. ASTM G155 - Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Nonmetallic Materials 2013.

P. ATBCB PROWAG - Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way 2011.

Q. SAE AMS-STD-595 - Colors Used in Government Procurement 2017a.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturer's product data, standard details, details specific to this project; written installation and maintenance instructions.

C. Warranty: Submit manufacturer warranty; complete forms in City's name and register with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver to project site in manufacturer's protective wrapping and in manufacturer's unopened packaging.

B. Store covered and elevated above grade and in manufacturer's unopened packaging until ready for installation. Maintain at ambient temperature between 40 and 90 degrees F.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Plastic Tiles: Provide manufacturer's standard five year warranty against manufacturing defects, breakage or deformation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Plastic Tactile and Detectable Warning Surface Tiles:
   1. Access Tile, a brand of Access Products, Inc: www.accesstile.com/#sle.
   2. ADA Solutions, LLC: www.adatile.com/#sle.
   3. Armor-Tile, a brand of Engineered Plastics, Inc: www.armortiletransit.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 TACTILE AND DETECTABLE WARNING DEVICES

A. Plastic Tactile and Detectable Warning Tiles: ADA Standards compliant, glass fiber and carbon fiber reinforced, exterior grade, matte finish polyester sheet with truncated dome pattern, solid color throughout, internal reinforcing of sheet and of truncated domes, integral radius cut lines on back face of tile; with factory-applied removable protective sheeting.
   1. Material Properties:
      a. Water Absorption: 0.20 percent, maximum, when tested in accordance with ASTM D570.
      b. Slip Resistance: 0.50 minimum dry static coefficient of friction, when tested in accordance with ASTM D2047.
      c. Compressive Strength: 25,000 pounds per square inch, minimum, when tested in accordance with ASTM D695.
      d. Tensile Strength: 10,000 pounds per square inch, minimum, when tested in accordance with ASTM D638.
      e. Flexural Strength: 25,000 pounds per square inch minimum, when tested in accordance with ASTM D790.
      f. Chemical Stain Resistance: No reaction to 1 percent hydrochloric acid, motor oil, calcium chloride, gum, soap solution, bleach, or antifreeze, when tested in accordance with ASTM D543.
      g. Abrasion Resistance: 300, minimum, when tested in accordance with ASTM C501.
      h. Flame Spread Index: 25, maximum, when tested in accordance with ASTM E84.
      i. Accelerated Weathering: Delta-E of less than 5.0 at 2,000 hours exposure, when tested in accordance with ASTM G155.
      j. Adhesion: No delamination of tile prior to board failure in a temperature range of 20 to 180 degrees F, when tested in accordance with ASTM C903.
      k. Loading: No damage when tested according to AASHTO LRFD test method HS20.
      l. Salt and Spray Performance: No deterioration or other defect after 200 hours of exposure, when tested in accordance with ASTM B117.
   2. Pattern: In-line pattern of truncated domes complying with ADA Standards.
   3. Edge: Square.
   4. Joint: Butt.

5. Color: As selected by Architect from manufacturer's standard range.
6. Color: SAE AMS-STD-595, Table IV, Federal Yellow No. 33538.

2.03 ACCESSORIES

A. Fasteners: ASTM A666, Type 304 stainless steel
   1. Type: Countersunk, color matched composite sleeve anchors
   2. Size: 1/4 inch diameter and 1-1/2 inches long.

B. Adhesive: Type recommended and approved by surfacing tile manufacturer.

C. Sealant: Elastomeric sealant of color to match adjacent surfaces; approved by surfacing tile manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. When installation location is near site boundary or property line, verify required location using property survey.

B. Verify that work area is ready to receive work:
   1. If existing conditions are not as required to properly complete the work of this section, notify Architect.
   2. Do not proceed with installation until deficiencies in existing conditions have been corrected.

C. Verify that dimensions, tolerances, and attachment methods for work in this section are properly coordinated with other work on site.

3.02 INSTALLATION, GENERAL

A. Install in accordance with manufacturer's written instructions.
   1. Do not install damaged, warped, bowed, dented, abraded, or otherwise defective units.
   2. Do not install when ambient or substrate temperature has been below 40 degrees F during the preceding 8 daylight hours.

B. Field Adjustment:
   1. Locate relative to curb line in compliance with ATBCB PROWAG, Sections 304 and 305.
   2. Orient so dome pattern is aligned with the direction of ramp.

C. Install units fully seated to substrate, square to straight edges and flat to required slope.

3.03 INSTALLATION, SURFACE APPLIED PLASTIC TILES

A. Cure concrete surfaces for a minimum of 4 days before installing units.

B. Verify substrate is clean and dry; free of voids, projections and loose material. Remove dust, oil, grease, curing compounds, sealers and other substances that may interfere with adhesive bond or sealant adhesion.

C. Mechanically roughen surface as required to remove contaminants and prepare surface for adhesive and sealant application.

D. Drill fastener holes straight, true and to depth recommended by manufacturer.

E. Apply adhesive to back of unit as recommended by manufacturer.

F. Mechanically fasten to substrate. Avoid striking or damaging the unit itself during installation.

G. Apply sealant to edges in cove profile.

3.04 CLEANING PLASTIC UNITS

A. Remove protective plastic sheeting within 24 hours of installation.

B. Remove excess sealant or adhesive from joints and edges.

C. Clean four days prior to date of scheduled inspection.

3.05 PROTECTION

A. Protect installed units from traffic, subsequent construction operations or other imposed loads until concrete is fully cured.

B. Touch-up, repair or replace damaged products prior to Date of Substantial Completion.

END OF SECTION 32 17 26

SECTION 32 31 19
DECORATIVE METAL FENCES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Decorative ornamental galvanized metal tubular picket fence system.

1.02 RELATED REQUIREMENTS

A. City of Stockton typical details M-6

B. Section 03 30 00 - Cast-in-Place Concrete: post footings.

C. Section 31 23 33 - Trenching and Backfilling.

D. Section 32 13 13 - Concrete Paving.

E. Section 32 31 32 - Security Gates.

F. Section 32 31 36 - Security Barriers: high security bollards.

1.03 REFERENCE STANDARDS

A. City of Stockton Standard Details: Tubular steel fence detail; 2003.

B. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes 2017.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.

D. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus 2019.

E. ASTM D523 - Standard Test Method for Specular Gloss 2014 (Reapproved 2018).

F. ASTM D714 - Standard Test Method for Evaluating Degree of Blistering of Paints 2002 (Reapproved 2017).

G. ASTM D822/D822M - Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings 2013 (Reapproved 2018).

H. ASTM D1654 - Standard Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments 2008, with Editorial Revision (2017).

I. ASTM D2244 - Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates 2021.

J. ASTM D2794 - Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact) 1993 (Reapproved 2019).

K. ASTM D3359 - Standard Test Method for Rating Adhesion by Tape Test 2017.

L. ASTM F2408 - Standard Specification for Ornamental Fences Employing Galvanized Steel Tubular Pickets 2016.

M. CLFMI WLG 2445 - Wind Load Guide for the Selection of Line Post and Line Post Spacing 2018.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to start of work of this section; require attendance by affected installers.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Design Calculations: For high wind load areas, provide calculations for fence panels and accessory selection as well as line post spacing and foundation details. See CLFMI WLG 2445 for line post and spacing guidance.

D. Shop Drawings:
   1. Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, gates, and schedule of components.

E. Manufacturer's Qualification Statement.

F. Installer's Qualification Statement.

G. Field Inspection Records: Provide installation inspection records that include post settings, framework, fittings and accessories, gates, and workmanship.

H. Manufacturer's Warranty: Pickets, Posts, and Rails standard limited warranty that ornamental fence system is free from defects in material and workmanship including cracking, peeling, blistering and corroding for a period of 10 years from the date of purchase.

I. Maintenance Materials: Furnish the following for City's use in maintenance of project:
   1. See Section 01 60 00 - Product Requirements, for additional provisions.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum five years documented experience.

B. Installer Qualifications: Experienced with type of construction involved and materials and techniques specified and approved by fence manufacturer.

1.07 DELIVERY, STORAGE AND HANDLING

A. Store materials in a manner to ensure proper ventilation and drainage. Protect against damage, weather, vandalism and theft.

1.08 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a 10 year period after Date of Substantial Completion.

C. Provide 10 year manufacturer warranty for complete fence system, warranting that the system is free from defects in material and workmanship including cracking, peeling, blistering and corroding for a period of 10 years from the date of purchase.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Decorative Metal Fences and Gates:
   1. Basis of Design: Merchants Metals; Industrial Secure Weld Plus: www.merchantsmetals.com.
      a. Products from other qualified manufacturers who have five years or more experience manufacturing steel ornamental picket fencing will be considered by the Architect as equal if approved in writing 10 days prior to bidding, and they meet all specifications for design, size, and gauge of metal parts and fabrication. Picket fences and gates must be obtained from a single source.
   2. Ameristar Perimeter Security, USA: www.ameristarfence.com/#sle.
   3. All Steel Fence, Inc.: allsteelfenceinc.com
   4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 FENCES

A. All fences and gates to match style and color of existing fencing and gates on site.

B. Fences: Complete factory-fabricated system of posts and panels, accessories, fittings, and fasteners; finished with electrodeposition coating, and having the following performance characteristics:

1. Capable of resisting vertical load, horizontal load and infill performance requirements for fence categories defined in ASTM F2408.

C. Electro-Deposition Coating: Multistage pretreatment/wash with zinc phosphate, followed by epoxy primer and acrylic topcoat.
   1. Total Coating Thickness: 2 mils, minimum.
   2. Coating Performance: Comply with general requirements of ASTM F2408.
      a. Adhesion: ASTM D3359 (Method B); Class 3B with 90 percent or more of coating remaining in tested area.
      b. Corrosion Resistance: ASTM B117, ASTM D714 and ASTM D1654; 1/8 inch coating loss or medium No.8 blisters after 1,500 hours.
      c. Impact Resistance: ASTM D2794; 60 inch pounds.
      d. Weathering Resistance: ASTM D523, ASTM D822/D822M and ASTM D2244; less than 60 percent loss of gloss.

D. Steel: ASTM A653/A653M; tensile strength 45,000 psi, minimum.
   1. Hot-dip galvanized; ASTM A653/A653M, G60.
   2. 62 percent recycled steel, minimum.

E. Fasteners: ASTM A276/A276M, Type 302 stainless steel; finished to match fence components.
   1. Tamper-proof security bolts.
   2. Self-drilling hex-head screws.

2.03 WELDED STEEL FENCE

A. Provide fence meeting requirements for Industrial class as defined by ASTM F2408.

B. Style: Lafayette.

C. Securely welded biasable fence system shall rack 45 degrees based on an 8’ nominal panel if required.

D. Nominal height: Match existing fencing height and panel spacing.

E. Fence Panels: Fusion welded; 7 feet high by 6 feet long maximum.

F. Pickets, Posts, and Rails: Industrial galvanized square steel tubular members manufactured per ASTM F2408, having minimum yield strength of 45,000 psi.
   1. Pickets: 1” square 15 gauge minimum at 5” O.C.
   2. Rails:1 1/2” square 11 gauge minimum.
   3. Posts: 2 1/2" square 11 gauge minimum @ 10'-0" o.c. max.
   4. Gate Posts: 4" square 11 gauge minimum

G. Finish: Manufactured in compliance with ASTM F2408 - Corrosion Resistance Salt Spray Test per ASTM B117, Impact Resistance per ASTM D2794, and Adhesion per ASTM D3359 Method B. All primary components shall receive a thorough cleaning and pre-treatment with a 10-step process: Hot alkaline cleaner, clear water rinse, hot iron phosphate application, clear water rinse, reverse Osmosis rinse, dry off oven heat, zinc enriched powder primer coat at 2-4 mils., gel oven heat, Ultra polyester finish T.G.I.C. powder coat at 2-4 mils., and final curing oven.

H. Color: match existing fencing on site.

I. All welds shall be re-galvanized and properly coated.

2.04 ACCESSORIES

A. Rail/Post Bracket – Bracket system ensures easy installation without the need to weld in the field.

B. Post Caps: Formed steel manufactured to form a weather-tight closure.

C. Finial Tops for Pickets – Quad Flair with Ball.

2.05 SPECIALTY HARDWARE

A. Hinges: Finished to match fence components.
   1. Closing: operator hardware.

2. Material: Steel.

B. Latches: Finished to match fence components.
   1. See hardware spec and gate schedule on drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions and per City of Stockton Standard Details.

B. Install each post in 12" dia. concrete pier with (4) #4 veritcal & #3 hoops @ 12" o.c. minimum.

C. Install 12" wide x 4" depth concrete band (6" from centerline of fence to each side) along fence and gate alignment.

D. Weld caps on all post tubing.

E. Set fence posts in accordance with the manufacturer recommended spacing.

F. When cutting rails immediately seal the exposed surfaces by:
   1. Removing metal shavings from cut area.
   2. Apply zinc-rich primer to thoroughly cover cut edge and drilled hole; allow to dry.
   3. Apply two coats of custom finish spray paint matching fence color.
   4. Failure to seal exposed surfaces in accordance with manufacturer's instructions will negate manufacturer's warranty.

G. Space gate posts according to the manufacturers' drawings, dependent on standard out-to-out gate leaf dimensions and gate hardware selected.
   1. Base type and quantity of gate hinges on the application, weight, height, and number of gate cycles.
   2. Identify the necessary hardware required for the application on the manufacturer's gate drawings.
   3. Provide gate hardware by the manufacturer of the gate and install in compliance with manufacturer's recommendations.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch.

B. Maximum Offset From Indicated Position: 1 inch.

C. Minimum Distance from Property Line: 6 inches.

3.05 CLEANING

A. Leave immediate work area neat at end of work day.

B. Clean jobsite of excess materials; scatter excess material from post hole excavations uniformly away from posts. Remove excess material if required.

C. Clean fence with mild household detergent and clean water rinse well.

D. Remove mortar from exposed posts and other fencing material using a 10 percent solution of muriatic acid followed immediately by several rinses with clean water.

E. Touch up scratched surfaces using materials recommended by manufacturer. Match touched-up paint color to factory-applied finish.

3.06 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair, or replace damaged products before Date of Substantial Completion.

END OF SECTION 32 31 19

This page intentionally left blank

SECTION 32 31 32
SECURITY GATES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Security Gates: Manual vehicle rolling (aka slide) gates and manual personnel swing gates

1.02 RELATED REQUIREMENTS

A. City of Stockton Standard Details: Tubular steel fence detail; 2003.

B. Section 03 30 00 - Cast-in-Place Concrete.

C. Division 26: Provide power and data connections.

D. Division 28: Provide security, access control, and video surveillance connections.

E. Section 31 23 16 - Excavation: Trenching for utility connections.

F. Section 32 31 19 - Decorative Metal Fences

1.03 PRICE AND PAYMENT PROCEDURES

A. Allowances: See Section 01 21 00 - Allowances, for cash allowances affecting this section.

1.04 REFERENCE STANDARDS

A. CLFMI WLG 2445 - Wind Load Guide for the Selection of Line Post and Line Post Spacing 2018.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate installation of units with size, location, and installation of service utilities.

B. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to start of work of this section; require attendance by affected installers.

C. Sequencing: Ensure that utility connections are completed in an orderly and expeditious manner.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Design Calculations: For high wind load areas, provide calculations for fence panels and accessory selection as well as line post spacing and foundation details. See CLFMI WLG 2445 for line post and spacing guidance.

D. Shop Drawings:
   1. Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, gates, and schedule of components.
   2. Provide drawings showing pedestrian and vehicle gate construction. Include diagonal bracing required in addition to standard fence construction per section 32 31 19.

E. Manufacturer's Qualification Statement.

F. Installer's Qualification Statement.

G. Field Inspection Records: Provide installation inspection records that include post settings, framework, fittings and accessories, gates, and workmanship.

H. Manufacturer's Warranty: Pickets, Posts, and Rails standard limited warranty that ornamental fence system is free from defects in material and workmanship including cracking, peeling, blistering and corroding for a period of 10 years from the date of purchase.

I. Maintenance Materials: Furnish the following for City's use in maintenance of project:
   1. See Section 01 60 00 - Product Requirements, for additional provisions.

1.07 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum 10 years documented experience.

B. Installer Qualifications: Experienced with type of construction involved and materials and techniques specified and approved by fence manufacturer.

1.08 DELIVERY, STORAGE AND HANDLING

A. Store materials in a manner to ensure proper ventilation and drainage. Protect against damage, weather, vandalism and theft.

1.09 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a one year period after Date of Substantial Completion.

C. Provide one year manufacturer warranty for material and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Security Gates:
   1. Basis of Design: Merchants Metals; Secure Weld Plus Gate: www.merchantsmetals.com.
   2. Ameristar Perimeter Security, USA; PassPort II Gate: www.ameristarfence.com/#sle.
   3. All Steel Fence, Inc.: allsteelfenceinc.com
   4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 SECURITY GATES

A. Comply with UL 325, Class I and ASTM F2200.

B. Rolling (aka Slide) Gate
   1. Basis of Design: Passport Commercial Gate Steel Roll Gate System
   2. Steel material for roll gate components (i.e. pickets, rails, diagonals and uprights), shall be commercial steel with a minimum yield strength of 45,000 psi (344 MPa).
   3. Height: See Gate Schedule on AS-101
   4. Length: See Gate Schedule on AS-101
   5. Operation: Manual slider with locking system.
   6. Finish: Per Section 32 31 19 - Decorative Metal Fences.
   7. Gate Frame: ASTM 1183 Type II Class 2 Gate to be made of Aluminium Alloy 6063-T6. All square upright members are 2" sq. weighing 0.94 lb/ft ASTM B221. Complete frame welded to top and bottom frame member 4"x2" rail weighing 1.71 lbs./ft/
   8. Interior Horizontal Rails: Aluminium "U" channels - 1-3/8" wide x 1-1/2" high, 11 gauge metal thickness. Rails must be punched to receive pickets and rivets. Rails welded inside vertical external uprights. Pickets size and style to match fence style. Pickets to be welded to exterior horizontal members.
   9. "Secure V-Track" a 1/4"x3" galvanized angle track and will withstand a 2,000# reaction load.
   10. Gate post brackets, latch and keepers are galvanized steel.
   11. Bracket and roller assemble 2-1/2"x6" rubber rollers.
   12. Gate post are 4" sq. weighing 5.77 lb/ft.
   13. Single gates require 5 gate posts. (1 latch post and 2 dual guide rollers support posts).
   14. See Gate schedule on AS-101 sheet for hardware details.
   15. See detail D1/AS-203.

C. Single and Double Swing Gate:
   1. Basis of Design: Swing gate Ameristar Passport Commercial Gate.

2. Height: See Gate Schedule on AS-101.
3. Length: See Gate Schedule on AS-101.
4. Operation: Manual swing.
5. Finish: Per Section 32 31 19 - Decorative Metal Fences.
6. Gate Frame: Ornamental metal swing gate frames are to be fabricated of galvanized steel tubing ASTM A-924/A-924M, of structural steel having a 45,000 psi tensile strength and a G90 zinc coating. Members welded with stainless steel rods, forming a rigid one piece unit (no substitutions). Vertical upright members 2" sq. 11 ga. metal thickness.
7. For gate leaves up to 6'-0" the horizontal rails to be 1-1/2” square, 11 gauge thick galvanized steel with 1" pickets space 5” maximum face to face. Attach each picket to rail with automated welding by the gas metal arc method. Minimum gauge picket wall thickness 15 gauge.
8. Posts: Made of steel tube, per ASTM A-500 in line hot-dip galvanized exterior zinc coating steel to have 45,000 psi yield strength. Post size 4” square. Posts to have 11 gauge wall thickness.
9. Hardware: Galvanized steel and or malleable steel to suit gate application. Hinges shall be stainless stell five knuckle bearing with non-removable pin and stainless stell fasteners. Provide panic bar exit device with reinforce mounting for mortise lockset on non-secure side. See Gate schedule on AS-101
10. See detail C4/AS-203 for Single Swing Gate and detail D5/AS-203 for Double Swing Gate.
11. See Gate schedule for gates to receive card readers. See security drawings and specs for additional information.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Protect existing work from damage due to installation of this work.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions and per City of Stockton Standard Details.

B. Install 12" wide x 4" depth concrete band (6" from centerline of fence to each side) along fence and gate alignment.

C. Install each post in 12" dia. concrete pier with (4) #4 veritcal & #3 hoops @ 12" o.c. minimum.

D. Weld caps on all post tubing.

E. When cutting rails immediately seal the exposed surfaces by:
   1. Removing metal shavings from cut area.
   2. Apply zinc-rich primer to thoroughly cover cut edge and drilled hole; allow to dry.
   3. Apply two coats of custom finish spray paint matching fence color.
   4. Failure to seal exposed surfaces in accordance with manufacturer's instructions will negate manufacturer's warranty.

F. Space gate posts according to the manufacturers' drawings, dependent on standard out-to-out gate leaf dimensions and gate hardware selected.
   1. Base type and quantity of gate hinges on the application, weight, height, and number of gate cycles.
   2. Identify the necessary hardware required for the application on the manufacturer's gate drawings.
   3. Provide gate hardware by the manufacturer of the gate and install in compliance with manufacturer's recommendations.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch.

B. Maximum Offset From Indicated Position: 1 inch.

C. Minimum Distance from Property Line: 6 inches.

3.05 CLEANING

A. Leave immediate work area neat at end of work day.

B. Clean jobsite of excess materials; scatter excess material from post hole excavations uniformly away from posts. Remove excess material if required.

C. Clean fence with mild household detergent and clean water rinse well.

D. Remove mortar from exposed posts and other fencing material using a 10 percent solution of muriatic acid followed immediately by several rinses with clean water.

E. Touch up scratched surfaces using materials recommended by manufacturer. Match touched-up paint color to factory-applied finish.

3.06 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair, or replace damaged products before Date of Substantial Completion.

END OF SECTION 32 31 32

SECTION 32 31 36
SECURITY BARRIERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Security barriers: high security bollards.

1.02 RELATED REQUIREMENTS

A.

B. Section 32 13 13 - Concrete Paving: Installation of adjacent paved surfaces.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Provide detailed drawings showing:
   1. Layout and overall dimensions on site, showing footing locations including mounting details of each element.
   2. Foundation and anchoring requirements of the barrier elements.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.

1.05 DELIVERY, STORAGE AND HANDLING

A. Store materials in a manner to ensure proper ventilation and drainage. Protect against damage, weather, vandalism and theft.

1.06 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a one year period after Date of Substantial Completion.

C. Provide one year manufacturer warranty for materials and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Security Barriers:
   1. Basis of Design: Petersen Manufacturing Co. Inc; Model B9: www.petersenmfg.com
   2. Sanderson Concrete, Inc.; Metro 60: www.sandersonconcrete.com.
   3. Postguard: www.postguard.com.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 NON-AUTOMATED BARRIERS

A. Fixed Bollards: Permanently installed pre-cast concrete bollards.
   1. Crash Test Rating: able to withstand 15-25 MPH impact of sedan.
   2. Bollard Design: Round, diameter 16 inches.
   3. Mounting: protruding steel pipe set in concrete footing.
   4. Height: 38 inches.
   5. Weight: 570 lbs.
   6. Finish: Snow white LSB
   7. Model Number: B-9

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions:
   1. Verify location of existing utilities, grades and conditions of substrate.

3.02 PREPARATION

A. Protect existing work from damage due to installation of this work.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.04 FIELD QUALITY CONTROL

A. Provide manufacturer's certified, field supervisor during key milestones of the installation of the barrier.

3.05 CLEANING

A. Touch up scratched surfaces using materials recommended by manufacturer. Match touched-up paint color to factory-applied finish.

3.06 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

3.07 PROTECTION

A. Protect installed units from subsequent construction operations.

B. Do not permit traffic over unprotected barrier device.

3.08 MAINTENANCE

A. See Section 01 70 00 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

END OF SECTION 32 31 36

SECTION 32 33 13
SITE BICYCLE RACKS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Exterior bicycle racks.

1.02 RELATED REQUIREMENTS

A. Section 32 13 13 - Concrete Paving: Mounting surface for bicycle racks.

1.03 REFERENCE STANDARDS

A. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless 2020.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and patterns.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Handle racks with sufficient care to prevent scratches and other damage to the finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Exterior Bicycle Racks:
   1. The Park Catalog: www.theparkcatalog.com.
   2. American Bicycle Security Company: www.ameribike.com/#sle.
   3. Columbia Cascade Company: www.timberform.com/#sle.

2.02 BICYCLE RACKS

A. Exterior Bicycle Racks: Device allows user-provided lock to simultaneously secure one wheel and part of the frame on each bicycle parked or racked.
   1. Type 1 - Secure Staff area: Serpentine rack formed from a continuous round pipe.
      a. Capacity: five bicycles.
   2. Type 2 - Public entry: Custom Laser cut panel with City Logo.
      a. Capacity: two bicycles.
   3. Mounting, Ground: In-ground anchor.
   4. Finish: Powder coat, maintenance-free and weather-resistant.
   5. Color: As selected by Architect from manufacturer's standard range.
   6. Accessories: In-ground grout cover.

B. Materials:
   1. Pipe: Carbon steel, ASTM A53/A53M, Schedule 40.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine surfaces to receive bicycle racks.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory conditions before proceeding.

C. Do not begin installation until unsatisfactory conditions are corrected.

3.02 PREPARATION

A. Ensure surfaces to receive bicycle racks are clean, flat, and level.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install level, plumb, square, and correctly located as indicated on drawings.

C. In-Ground Anchor Installation:
   1. Prepare holes in size according to manufacturer’s instructions.
   2. Place anchoring bolts through the holes in pipe.
   3. Lower rack into holes, ensuring the bottom of lower bends are at least 1-1/2 inch from the ground.
   4. Place concrete.
   5. Level rack before concrete sets.
   6. Support until dry.

D. Surface Flange Installation: Anchor bicycle racks securely in place with 1/2 inch by 4 inch anchor bolts through flange holes. Surface installation acceptable where anchoring into existing pavement.

3.04 CLEANING

A. Clean installed work to like-new condition. Do not use cleaning materials or methods that could damage finish.

3.05 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION 32 33 13

SECTION 32 84 00

PLANTING IRRIGATION

PART 1 - GENERAL

1.01 SUMMARY DESCRIPTION

A. Scope of Work

1. Provide irrigation systems as shown on the Drawings and described herein.

B. Related Work

1. Section 01 23 00 Alternates

2. Division 26 Electrical: Power connection for controller.

1.02 SUBMITTALS

A. Material List

1. Complete manufacturer's technical data and installation instructions shall be submitted prior to performing any work. Material list shall include the manufacturer, model number and description of all materials and equipment to be used.

B. Record Drawings

1. The original record drawings shall be submitted to the Owner's Representative for approval prior to making the controller chart. Refer to Section 01 78 39 Project Record Documents.

2. Drawings shall include dimensions from two permanent points of reference such as building corners, sidewalks, or road intersections for the location of the following items:

a. Connection to existing water lines.

b. Connection to existing electrical power and splice locations.

c. Relocated existing equipment.

d. Gate valves.

e. Routing of sprinkler pressure lines.

f. Sprinkler control valves.

g. Routing of control wiring.

h. Quick coupling valves.

i. Other related equipment as directed by the Owner's Representative.

C. Controller Charts

1. Controller charts shall be prepared by Contractor.

2. Provide one controller chart for each controller supplied.

3. The chart shall show the area controlled by the automatic controller and shall be the maximum size which the controller door will allow when rolled up.

4. The chart shall be a reduced drawing of the actual as-built system and shall be readable when reduced.

5. The chart shall be a black line print and different colors shall be used to indicate the area of coverage for each station.

6. When completed and approved, the chart shall be hermetically sealed between two pieces of plastic, each piece being a minimum 10 mils if required by Owner's Representative.

7. As-built record drawings and controller charts shall be completed and approved prior to final inspection of the irrigation system.

D. Operation and Maintenance Manuals

1. Contractor shall prepare Operation and Maintenance Manuals in accordance with Section 01 78 00 Close-out Submittals.

a. Index sheet stating Contractor's address and telephone number, list of equipment with name and addresses of local manufacturer's representative.

b. Catalog and parts sheets on all material and equipment installed under this contract (not
necessary for campus standard irrigation equipment).

c. Guarantee statement.

d. Complete operating and maintenance instructions on all major equipment.

E. Equipment to be Furnished

1. Furnish the following tools:

a. Two sets of special tools required for removing, disassembling and adjusting each type of sprinkler and valve provided on this project.

b. Two keys for each automatic controller.

c. Two quick coupler keys and matching hose swivels per project.

2. This equipment shall be furnished to Owner before final inspection can occur. Evidence that the Owner has received material must be provided to Owner's Representative.

1.03 QUALITY ASSURANCE

A. Manufacturer's directions and detailed drawings shall be followed in all cases where points are not shown in the Drawings and Specifications.

B. Drawings are generally diagrammatic and indicative of the work to be installed and do not show all offsets, fittings, sleeves, and other parts which may be required. Contractor shall carefully investigate the structural and finished conditions affecting all work and plan accordingly, furnishing such fittings, and other appurtenances as may be required to meet such conditions. The Work shall be installed in such a manner as to avoid conflicts between irrigation systems, planting, and architectural features.

C. Before commencing irrigation system installation, Contractor shall resolve obstructions, grade differences or discrepancies in area dimensions that might not have been considered in engineering and shown on the Drawings.

1.04 COORDINATION AND SCHEDULING

A. Contractor shall notify Owner's Representative in advance for the following observation meetings, according to the time indicated, and shall provide documentation to Owner's Representative that the following meetings occurred and their outcome.

1. Pre-job conference - 7 days.
2. Sleeve inspection – 48 hours.
3. Pressure supply line installation and testing - 48 hours.
4. Automatic controller installation - 48 hours.
5. Control wire installation - 48 hours.
6. Lateral line and sprinkler installation - 48 hours.
7. Coverage test (prior to any planting installation) - 48 hours.
8. Final inspection - 7 days.

PART 2 - PRODUCTS

2.01 PIPING MATERIALS

A. PVC Pressure Main Line Pipe and Fittings

1. Pressure main line piping for sizes 4 inches and larger shall be C-900 with mechanical joints.
2. Pressure main line piping smaller than 4 inches inside sleeves, shall be Schedule 40.
3. Pressure main line piping for sizes 3 and smaller shall be PVC Schedule 40 with solvent welded joints and with Schedule 80 fittings.
4. Pipe shall be made from NSF approved Type I, Grade I PVC compound conforming to ASTM resin specification D1785. All pipe shall meet requirements as set forth in Federal Specification PS-21-
70.
5. PVC solvent-weld fittings shall be Schedule 40, 1-2, II-I NSF approved conforming to ASTM test procedure D2466.
6. Solvent cement and primer for PVC solvent-weld pipe and fittings shall be of type and installation methods prescribed by the manufacturer.
7. All PVC pipe must bear the following markings:
    a. Manufacturer's name.
    b. Nominal pipe size.
    c. Schedule or class.
    d. Pressure rating in PSI.
    e. NSF (National Sanitation Foundation) approval.
    f. Date of extrusion.

8. All fittings shall bear the manufacturer's name or trademark, material designation, size, applicable Iron Pipe Size (IPS) schedule and NSF seal of approval.

B. PVC Non-Pressure Lateral Line Piping

1. Non-pressure buried lateral line piping shall be PVC schedule 40 with solvent-welded joints.

2. Pipe shall be made from NSF approved, Type I, Grade II PVC compound conforming to ASTM resin specification D1784. All pipe shall meet requirements set forth in Federal Specification PS-22-70 with an appropriate standard dimension ratio.

3. Except as noted above, all requirements for non-pressure lateral line pipe and fittings shall be the same as for solvent-weld pressure main line pipe and fittings as set forth in these specifications.

4. For all sprinkler head installations use schedule 80 thread nipples and risers, and schedule 40 fittings.

C. PVC Sleeves:

1. PVC sleeves shall be Schedule 40 with solvent weld joints. Install sleeves at 24 inches depth to top of pipe. Backfill sleeve trench with sand. Depth exception may be considered at concrete walks with prior approval by Owner’s Representative.

D. Brass Pipe and Fittings

1. Where indicated on the Drawings, use red brass threaded pipe.

2. Fittings shall be red brass conforming to Federal Specification #WW-P-460.

E. Galvanized Pipe Fittings

1. Where indicated on the Drawings, use galvanized steel pipe American National Standards Institute (ASA) Schedule 40 milled steel threaded pipe.

2. Fittings shall be medium galvanized screwed beaded malleable iron. Galvanized couplings may be merchant coupling.

3. All galvanized pipe and fittings installed below grade shall be wrapped with 2 layers of 10 mil pipe wrap.

4. Pipe lubricant: Permatex 51, or equal.

2.02 VALVES

A. Gate Valves

1. Gate valves 3 inches and larger shall be 125 lb. Static Water Pressure (SWP) bronze gate valve with screw-in bonnet, non-rising stem, solid wedge disc, threaded ends and a bronze or malleable iron handwheel, with a 2” operating nut.

2. Gate valves 2-1/2 inches and smaller shall be manufactured by Nibco, Aqua, Matco, or equal, 200 psi Water Oil Gas (WOG), 125 SWP, Screw-in bonnet, solid wedge.

B. Quick Coupling Valves

1. Quick coupling valves shall have a brass two-piece body designed for working pressure of 125 PSI operable with quick coupler.

2. Key size and type shall be as shown on Drawings.

3. Quick coupling valves shall be manufactured by Rain Bird (44LRC) or approved equal.

4. All quick coupling valves without integral stabilizers shall be equipped with cast ductile iron anti-rotation devices or anchors that attached to the base of the valve and can be secured by a single bolt, and shall be manufactured by Leemco (LS-120, LS-150), Harco (82201, 82202) or equal.

C. Electrical Remote Control Valves

1. Electric control valves shall have a manual flow adjustment.

2. Provide one control valve box for each electric control valve.

3. Electric Remote Control Valves shall be manufactured by Rain Bird (PESB) with scrubber, or equal.

4. Pressure regulating modules as required for pressure reduction on new or existing valves manufactured by Rain Bird (PRS Dial), or equal, as noted on Drawings.

5. For pipe connections to valve bodies use Teflon tape material. Pipe dope shall not be used.

D. Drip Assemblies

1. Electric Remote Control Valves shall be Rainbird Drip control kits with PESB valves and Pressure regulating quick check basket filter, or equal.

2. Filters, valves and pressure regulators shall be as manufactured by Netafim, Rainbird, or equal and shall be as follows:

(a) Flows between 0.3 GPM and 20.0 GPM

(b) Flows between 15 GPM and 40 GPM

E. Associated Valves

1. Wye-Strainer

a. Brass construction for 3” and smaller, Cast Iron with flanged ends for 4” and larger.

b. Stainless steel 80-mesh

c. Same size as mainline

2. Ball valves 3 inches and smaller shall be brass.

F. Flow Sensor and Master Valve

1. Flow sensor and master valve assemblies shall be per plans or equal and must operate with controller. Install both units after brass gate valve at point of water connection. The master valve shall be main line-sized for project and have the capacity to have additional systems added on in the future. The flow sensor may be main line-sized or smaller, as shown on Drawings. This maximizes flow management capabilities to reduce water window times and improve efficiency.

2.03 BACKFLOW PREVENTION UNITS

1. Backflow prevention unit assemblies shall be per plans or equal. Shall be manufactured by Zurn or equal, model per plan.

2.04 BOOSTER PUMP

A. Booster pump

1. All booster bump equipment including but not limited to mechanical pump, check valve,
pressure valve, and controls shall be located to area shown on plan. Rainbird booster pump or equal, per plan.

2. Install on concrete pad with proper holes for inlet, outlet and power.

3. The pump enclosure shall be of a vandal and weather resistant nature manufactured entirely of marine grade aluminum alloy 5052-H32, with a wall thickness of one eighth inch. The mounting base shall be manufactured entirely of stainless steel. The main housing shall be of solid sheet construction punched on the ends with louvers for ventilation. The enclosure shall be a center split design, having mounting lips on each end. The mounting base shall be submerged into the concrete a minimum of two inches, positioning the enclosure two and one half inches above the concrete for drainage purposes. The locking mechanism shall be of the full release type which allows for complete removal of the enclosure from its mounting base without the use of tools. The locking mechanism shall be a Stainless Steel Cross Bar style and provide for a padlock. Prior to ordering, contractor shall verify size of enclosure required to enclose all booster pump equipment. Rainbird models, VIT Strong Box Models PE-40AL/PE-60AL or equal.

2.05 CONTROL WIRING

A. Copper direct burial decoder cable with colored jacket sized according to length of the run, minimum 14
gauge. Run (1) extra set of decoder cable with a different colored jacket for future maintenance. All communication wire for controllers and sensors shall be installed in electrical conduit not less than 1 inch. Cable shall be manufactured by Rainbird, Hunter or approved equal.

B. Electrical Dry Connection. Spears DS -400, pre-filled dri-splice connector with crimp sleeves; DRYCONN #10222 waterproof connectors by King Innovations (#22 to #12 AWG), or equal. Waterproof under-ground wire connections.

2.06 AUTOMATIC CONTROLLERS

A. New automatic controller.

1. Locate as per plans.

2. Accessories per plans, no known equal.

2.07 MAIN LINE SHUT OFF BOX

A. Install main line shut off valve at point of connection in a Christy concrete G5 traffic box for main line shut off valves with “water” labeled lid, or equal.

2.08 CONTROL VALVE BOXES

A. Use 10 by 10-1/4 inch round box for all gate valves, Carson Industries #910-12B with green bolt down cover, or equal. Extension sleeve shall be PVC- 6 inch minimum size.

B. Use 9 1/2 by 16 by 11 inch rectangular box for all electrical control valves, Carson Industries 1419-13B with green bolt down cover, or equal.

2.09 SPRINKLER HEADS

A. All sprinkler heads on any one system (zone) shall be of the same size, type, and deliver the same rate of precipitation with the diameter (or radius) of throw, pressure, and discharge as shown on the Drawings and specified.

B. Double Swing Joint Assembly: These shall be fabricated in accordance with the detail. Use Schedule 80 threaded nipples and risers and Schedule 40 fittings.

C. Riser nipples for all sprinkler heads shall be the same size as the riser opening in the sprinkler body.

D. Low precipitation rate, multi-stream nozzles shall be Hunter MP Rotator series, or equal, and shall be used with 30psi or 40 psi pressure regulating heads (PROS-06/12-PRS40-CV-MP1000/2000/3000) per plans or equal.

2.10 LINE SOURCE SUB SURFACE DRIP IRRIGATION SYSTEMS

A. Drip tubing, type noted on Drawings.

1. Sub-surface drip tubing with in-line, pressure compensating emitters. Emitter and row spacing per Drawings.

2. Sub-surface drip tubing with in-line, pressure compensating emitters, factory wrapped with polypropylene fleece. Emitter and row spacing per Drawings.

2.11 DEEP ROOT WATERING TUBES

A. Deep Watering Tube: 4” diameter semi-rigid polyethylene mesh tube (36 inch) with adjustable bubbler. Construct assembly as shown in details or use Rainbird RWS or equal, size per Drawings.

2.12 REMOTE CONTROL VALVE IDENTIFICATION TAGS

A. 2-1/4 by 2-3/4 inch yellow polyurethane with valve number embossed on tag, as manufactured by Christy's Irrigation I.D. Tags, (714) 771-4142, or equal.

PART 3 - EXECUTION

3.01 INSPECTION

A. Exercise extreme care in excavating and working near existing utilities. Contractor shall be responsible for damages to utilities which are caused by Contractor's operations or neglect. Check existing Utilities Drawings for existing utility locations.

B. Refer to 1.4 Coordination and Scheduling for additional inspection requirements.

3.02 PREPARATION

A. Physical Layout

1. Prior to installation, Contractor shall stake out all pressure supply lines, routing and location of sprinkler heads and layout of drip tubing.

2. All piping and tubing layout shall be approved by Owner’s Representative prior to installation.

B. Water Supply

1. Point of Connection (POC): Install flow sensor and master valve assemblies after brass gate valve. The sizes of master valve and flow sensors to be main line-sized or larger for project and have the capacity to have additional systems added on in the future.

2. Electrical Supply

a. Electrical connections for automatic controller shall be made to electrical points of connection as indicated on the Drawings.

3.03 INSTALLATION

A. Irrigation Controller

1. Contractor shall test for radio signal strength at relocation site.

2. Remove existing irrigation controller and salvage for relocation. Abandon or remove all existing wires (at contractor's discretion).

3. Pour concrete pad in location shown on plan with appropriate conduits per plan details. Retrofit controller with appropriate upgrades as shown on plan and install at new location. Route wiring from all field valves and sensors to controller.

4. Contractor shall be responsible for final communications to Owner's central control system.

B. Trenching

1. Provide a minimum cover of 24 inches for all pressure supply lines.

2. Provide a minimum cover of 18 inches for all non-pressure PVC lines.

3. Provide a minimum cover of 4 inches for all drip tubing

4. Provide a minimum cover of 18 inches for all control wiring.

C. Backfilling

1. A fine granular material backfill shall be initially placed on all lines. No foreign matter larger than 1/4 inch in size will be permitted in the initial backfill. The trenches shall not be backfilled until all required tests are performed. Trenches shall be carefully backfilled with the excavated materials approved for backfilling, consisting of earth, loam, sandy clay, sand, or other approved materials, free from 4 inch or greater clods of earth or 1/4 inch or greater stones, gravel or other debris. Backfill shall be mechanically compacted in landscaped areas to a dry density equal to adjacent undisturbed soil in planting areas. Backfill shall conform to adjacent grades without dips, sunken areas, humps or other surface irregularities.

2. Flooding of trenches will be permitted only with approval of the Owner's Representative.

3. If settlement occurs and subsequent adjustments in pipe, valves, sprinkler heads, lawn or planting, or other construction are necessary, the Contractor shall make all required adjustments at no additional cost to the Owner.

D. Trenching and Backfill Under Paving

1. Trenches located under areas where paving (asphaltic concrete or concrete), will be installed shall be backfilled with sand (a layer 6 inches below the pipe and 3 inches above the pipe) and compacted in layers to 95 percent compaction, using manual or mechanical tamping devices. Trenches for piping shall be compacted to equal the compaction of the existing adjacent undisturbed soil and shall be left in a firm unyielding condition. All trenches shall be left flush with the adjoining grade. The Contractor shall set in place, as part of the sprinkler Work, cap and pressure test all piping under paving prior to the paving Work.

2. Piping under existing walks shall be done by jacking, boring or hydraulic driving where possible. Where any cutting or breaking of sidewalks or concrete is necessary permission shall be obtained from the Owner's Representative. No

hydraulic driving will be permitted under concrete paving. Concrete paving shall be replaced back to nearest control joint. See Section 01 73 20 Cutting and Patching.

3. Provide for a minimum cover of 18 inches between the top of the pipe and the bottom of the aggregate base for all pressure and non-pressure piping installed under asphaltic concrete paving.

E. Pipe Assemblies

1. PVC pipe and fittings shall be thoroughly cleaned of dirt, dust and moisture before installation. Installation and solvent welding methods shall be as recommended by the pipe and fitting manufacturer.

2. On PVC to metal connections, Contractor shall work the metal connections first. Pipe tape shall be used on all threaded PVC to PVC, and on all threaded PVC to metal joints. Light wrench pressure is all that is required. Where threaded PVC connections are required, use threaded PVC adapters or machined PVC schedule 80 pipe nipples into which the pipe may be welded.
Do not install multiple assemblies in plastic sleeves.

3. Use fittings to change pipe directions. Do not deflect pipe beyond manufacturer's recommendations.

4. Do not install joints in sleeves or under pavement if length is less than 20 feet. Where pipe length exceeds 20 feet, use minimum number of joints.

5. Install PVC piping and fittings without tension on the fittings. Pipes should be inserted squrely and fully into socket of fittings.

F. Pipe Clearance: All pipes shall have a minimum clearance of 6 inches from each other and from lines of other Work. Parallel pipes shall not be installed directly over one another. No more than two pipes may be installed in a single trench.

G. High Voltage Wiring for Automatic Controller

1. Provide 120 volt power connection to the automatic controller.

H. Remote Control Valves

1. Install where shown on Drawings and details. When grouped together, allow at least 12 inches between valve box edges. Install each remote control valve in a separate valve box.

2. Each controller and station number shall be labeled at the valve with a 2-1/4 by 2-3/4 inch yellow polyurethane I.D. tag attached to the control wire of the valve.

3. Set valve boxes perpendicular to adjacent walls and parallel to one another.

4. Thoroughly flush mainline before installing valves.

5. Install valve and box to maintain a minimum of 1 inch clear space between the top of the valve and the lid of the box.

6. Install valve box at the same level as soil grade, not above.

I. Control Wiring

1. Wiring shall occupy the same trench and shall be installed along the same route as pressure supply or lateral lines wherever possible.

2. Where more than 1 wire is placed in a trench, the wiring shall be taped together at intervals of 10 feet.

3. An expansion curl shall be provided within 3 feet of each wire connection. Expansion curl at electric control valves shall be of sufficient length so that in case of repair, the valve bonnet may be brought to the surface without disconnecting the control wires. Control wires shall be laid loosely in trench without stress or stretching of control wire conductors.

4. All splices shall be made with electric dry connections. Use one splice per connector.

5. Field splices between the automatic controller and electrical control valves will not be allowed without prior approval of Owner's Representative.

J. Flushing of System

1. After all new sprinkler pipe lines and risers are in place and connected, all necessary diversion work has been completed, and prior to installation of sprinkler heads, the control valves shall be opened and a full head of water used to flush out the system.

2. Sprinkler heads shall be installed only after flushing of the system has been accomplished to the complete satisfaction of the Owner's Representative.

3.04 EXISTING TREES

A. Where it is necessary to excavate adjacent to existing trees, the Contractor shall first discuss with the Owner's Representative and get written permission for proposed trench route. Contractor shall use all possible care to avoid injury to trees and tree roots.

3.05 FIELD QUALITY CONTROL

A. Testing of Irrigation System

1. Contractor shall request the presence of the Owner's Representative in writing at least 48 hours in advance of testing. Testing of pressure mainlines shall occur prior to installation of electric control valves.

2. Test all pressure lines under hydrostatic pressure of 150 pounds per square inch, and prove watertight.

3. All piping under paved areas shall be tested under hydrostatic pressure of 150 pounds per square inch, and proved watertight, prior to paving.

4. Sustain pressure in lines for not less than 2 hours. If leaks develop, replace joints and repeat test until entire system is proven watertight.

5. All hydrostatic tests shall be made in the presence of Owner's Representative. No pipe shall be backfilled until it has been inspected, tested and approved in writing.

6. Furnish necessary force pump and all other test equipment.

7. When the sprinkler irrigation system is completed, perform a coverage test in the presence of the Owner's Representative, to determine if the water coverage for planting areas is complete and adequate. This test shall be accomplished before any plants are planted.

B. Adjustment of the System

1. Contractor shall flush and adjust all sprinkler heads for optimum performance and to prevent overspray onto walks, roadways, and buildings as much as possible.

2. If it is determined that adjustments in the irrigation equipment will provide proper and more adequate coverage Contractor shall make such adjustments prior to

planting. Adjustments may also include changes in nozzle sizes and degrees of arc as required.

3. All sprinkler heads shall be set perpendicular to finished grades unless otherwise shown on the Drawings.

C. The entire sprinkler irrigation system shall be under full automatic operation for a period of 2 days prior to any planting. The Owner's Representative reserves the right to waive or shorten the operation period.

3.06 CLEAN-UP

A. Refuse and excess dirt shall be removed from the site, all walks and paving shall be broomed or washed down.

3.07 FINAL OBSERVATION PRIOR TO ACCEPTANCE

A. Contractor shall operate each system in its entirety for the Owner's Representative at time of final observation. Any items deemed not acceptable by the Owner's Representative shall be reworked to the complete satisfaction of the Owner's Representative.

B. The controller must be set up and under full automatic operation before final inspection can occur and maintenance period can begin.

C. Controller charts and final as-built record drawings shall be submitted in both electronic form and as 1 full-size hard copy. Both must be provided to the Owner's Representative and approved before final inspection can occur and maintenance period can begin. Refer to 1.2.B. and C.

D. Contractor shall show evidence to the Owner's Representative that the Owner has received all accessories, charts, record drawings, and equipment as required before final inspection can occur.

END OF SECTION

This page intentionally left blank

SECTION 32 90 00

PLANTING

PART 1 - GENERAL

1.01 SUMMARY

A. Scope of Work: Provide landscape planting, complete in place, as shown and specified including; removal of rock, gravel and other construction related material, sub-grade treatment, soil replacement, rough grading, soil amendment and preparation, finish grading, planting, seeding, staking, header installation, decomposed granite installation, clean-up, and maintenance.

B. Related Sections:

1. Section 01 23 00 Alternates

2. Section 32 84 00 Planting Irrigation

1.02 SUBMITTALS

A. Submit documentation to Owner's Representative at least 60 days before planting certifying that all plant material is available, listing sources of materials.

B. Submittals shall include but not be limited to the following:

1. Fertilizer: Chemical and percentage composition.

2. Mulch: Size, type of material.

3. Soil testing report (after rough grading)

4. Amendments: Type, size and composition.

5. Seed: Botanical and common name, percentage by weight, percentages of purity, germination and weed seed for each grass seed species.

6. Planting schedule indicating anticipated dates for planting.

7. Linear Root Barrier

C. Quality Assurance Submittals:

1. Plants shall be subject to inspection and approval by Owner's Representative at place of growth or upon delivery for conformity to specifications. Such approval shall not impair the right of inspection and rejection during progress of the work. The health and vigor of the plant material is the sole responsibility of Contractor. Submit written request for inspection of plant material at place of growth to Owner's Representative stating location and quantity of plants to be inspected.

1.03 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery

1. Deliver fertilizer to site in unopened containers bearing manufacturer's guaranteed chemical analysis.

2. Furnish Owner's Representative with copies of receipts for all amendments.

3. Deliver all plants with legible identification labels.

a. Label trees, shrubs, bundles of plants, or groundcover plants.

b. State correct plant name and size indicated on plant list.

c. Use durable waterproof labels with water-resistant ink which will remain legible for at least 60 days.

4. Protect plant material during delivery to prevent damage to root ball or desiccation of leaves.

5. Notify Owner's Representative 7 days in advance of delivery of all plant materials and submit an itemized list of the plants in each delivery.

6. Seed: Deliver seed in original sealed, labeled, and undamaged containers.

7. Ship and store seed, mulch and fertilizer with protection from weather or other conditions that would damage or impair the effectiveness of the product.

B. Storage

1. Store plant material in shade and protect from weather.

2. Maintain and protect plant material not to be planted within 4 hours in a healthy, vigorous condition.

C. Handling

1. Contractor is cautioned to exercise care in handling, loading, unloading and storing of plant materials. Plant materials that have been damaged in any way shall be discarded and shall be replaced with undamaged materials at the Contractor's expense.

1.04 COORDINATION AND SCHEDULING

A. Perform planting only when weather and soil conditions are suitable in accordance with standards of industry.

B. Scheduling: Install trees, shrubs, and liner stock plant material before wood mulch is spread.

C. Observation Schedule. Contractor shall notify Owner's Representative in advance for the following site visits, according to the time indicated:

1. Plant material review at growing site - notify Owner's Representative at least 30 days before planting.

2. Pre-job conference - 7 days.

3. Final grade review - 48 hours.

4. Soil preparation.

5. Plant material review - 48 hours.

6. Planting operation review: One tree and plant of each size and installation method shall be approved prior to planting. All trees shall be laid out or locations marked. - 48 hours.

7. Planting layout review: all potted plants (shrubs and groundcovers) shall be laid out for review prior to installation – 48 hours.

8. Pre-maintenance - 7 days.

9. Final acceptance - 7 days.

1.05 SAMPLES AND TESTS

A. Owner's Representative reserves the right to take and analyze samples of materials for conformity to specifications at any time. Contractor shall furnish samples upon request. Rejected materials shall be immediately removed from the site at Contractor's expense. Cost of testing of materials not meeting specifications shall be paid by Contractor.

B. Contractor shall have soil tested for soil amendments by a certified soil testing laboratory after rough grading operations are complete.

PART 2 - PRODUCTS

2.01 GENERAL

A. The following organic, soil amendments and fertilizer are based on typical campus soil composition and establish minimum requirements. Specific amendments and fertilizer amounts will be determined after rough grading operations are complete and soil samples are tested by the Contractor and approved by the Owner's Representative. The amounts listed in the Preparation section are considered minimum amounts for the project unless directed otherwise by the Owner's Representative.

B. All materials shall be of, approved and first-grade quality when installed and accepted. Any commercially processed or packaged material shall be delivered to the site in the original unopened container bearing the manufacturer's guaranteed analysis. Contractor shall supply Owner's Representative with a sample of all supplied materials accompanied by analytical data from an approved laboratory source illustrating compliance or bearing the manufacturer's guaranteed analysis.

2.02 HERBICIDES

A. Non-selective, systemic contact herbicide install per manufacturer's specifications, Roundup, or equal.

B. Pre-emergent herbicide (liquid or pelletized) install per manufacturer's specifications, Dimension or equal.

2.03 ORGANIC AMENDMENT

A. Amount of amendment shall be based on the soil analysis.

B. Green Compost: The producer shall be enrolled in the Seal of Testing Assurance Program (STA) sponsored by the US Composting Council and provide those specified test results. Test results shall list the source of the compost material and the location of where the compost was created. The compost shall pass all criteria for pathogens, heavy metals, maturity and stability. The compost shall be free of weeds and weed seeds, pathogens, Sudden Oak Death, trash, contaminants and foreign debris. The compost additionally shall comply with the following:

1. Gradation: A minimum of 90% of the material by weight shall pass a ½" screen. Material passing the ½" screen shall meet the following criteria.

PERCENT PASSING	SIEVE DESIGNATION
85 - 100	(3/8")
50 - 80	(No 8)
0 - 40	500 micron (No 35)

2. Organic content: Minimum 50% based on dry weight and determined by ash method. Minimum 250 lbs. organic matter per cubic yard of compost.

3. Carbon to nitrogen ratio: Maximum 30:1.

4. pH: 5.5 – 7.5 as determined in saturated paste and max 3 ppm soluble boron in the saturation extract.

5. Soluble salts: Soluble nutrients typically account for most of the salinity levels but sodium should account for less than 25% of the total. To avoid a leaching requirement, the addition of the compost shall result in a final ECe of the amended soil of less than 4.0 dS/m @ 77 degrees Fahrenheit as determined in a saturation extract.

2.04 SOIL AMENDMENTS

A. Soil Sulfur: Agricultural grade sulfur containing a minimum of 99 percent sulfur (expressed as elemental).

B. Iron Sulfate: 20 percent Iron (expressed as metallic iron), derived from ferric and ferrous sulphate, 10 percent sulfur (expressed as elemental).

C. Calcium Carbonate: 95 percent lime as derived from oyster shells.

D. Gypsum: Agricultural grade product containing 98 percent minimum calcium sulphate.

2.05 FERTILIZER

A. Plant Material One-Gallon Container Size or Larger

1. Planting Fertilizer: Pelleted or granular form shall consist of the following percents by weight and shall be mixed by commercial fertilizer supplier:

   a. 16 percent nitrogen

   b. 6 percent phosphoric acid

   c. 8 percent potash

2. Planting Tablets

   a. Shall be slow-released type with potential acidity of not more than 5 percent by weight containing the following percentages of nutrients by weight:

      (1) 20 percent nitrogen

      (2) 10 percent phosphoric acid

      (3) 5 percent potash

      (4) 2.6 percent combined calcium

      (5) 1.6 percent combined sulfur

      (6) 0.35 percent iron (elemental) from ferrous sulfate

   b. Shall be 21 gram tablets as manufactured by Agriform, Best Tabs, or equal, applied per manufacturer's instructions.

3. Sulphate of Potash: 0-0-50.

4. Single Super-phosphate: Commercial product containing 18-20 percent available phosphoric pentoxide

5. Urea Formaldehyde: 38-0-0.

B. Plugged Plant Material

1. Soil Conditioner

a. Gro-Power Plus (no known equal): Humus (bacteria included) based fertilizer and soil conditioner with soil penetrant shall consist of the following percents by weight:

5% nitrogen
3% phosphoric acid
1% potash
50% humus
15% humic acids

2.06 IMPORT TOPSOIL

A. Particle Size:

CLASS	PARTICLE SIZE RANGE	MAXIMUM, % WT.	MINIMUM, % WT.
Coarse Sand	0.5-2.0 mm	15	0
Silt Plus Clay	< 0.05 mm	50	25
Silt	0.002 - 0.05 mm	30	10
Clay	0 - 0.002 mm	25	10
OTHER CLASSES			
Gravel	2 - 13 mm	15	
Rock	> ½1/2 inch	10% by volume None > 1 inch	0
Organic Matter		15	0

B. The pH of saturated paste shall be between 5.5 and 7.5 without high qualitative lime content. The sodium absorption ratio (SAR) shall not exceed 6 and the electrical conductivity (ECe) of the saturation extract of this soil shall not exceed 3.0 milliohms per centimeter at 25 degrees centigrade. The boron content shall be no greater than one part per million as measured on the saturation extract. In order to ensure conformance, samples of the import soil shall be submitted to the laboratory for analysis prior to backfilling.

2.07 PLANT MATERIAL

A. Plants shall be in accordance with the California State Department of Agriculture's regulation for nursery inspections, rules and rating. All plants shall have a normal habit of growth and shall be sound, healthy, vigorous and free of insect infestations, weeds, plant diseases, sun scalds, fresh abrasions of the bark, excessive abrasions, or other objectionable disfigurements. Tree trunks shall be sturdy and have well "hardened" systems and vigorous and fibrous root systems that are not root or pot-bound. Root conditions of the plants provided by Contractor in containers will be determined by removal of earth from the roots of not less than two plants or more than 2 percent of the total number of plants of each species or variety. Where container-grown plants are from several sources, the roots of not less than 2 plants of each species or variety from each source, will be inspected. In case the sample plants inspected are found to be defective, the Owner’s Representative reserves the right to reject the entire lot or lots of plants represented by the defective samples.

B. The size of the plants shall correspond with that normally expected for species and variety of commercially available nursery stock or as shown on the Drawings. The minimum acceptable size of all plants measured before pruning with the branches in normal position, shall conform with the measurements, if any, shown on the Drawings. Plants larger in size than specified may be used with the approval of the Owner’s Representative. If the use of larger plants is approved, the ball of earth or spread of roots for each plant shall be increased proportionately.

C. All plants not conforming to the requirements herein specified, shall be considered defective and such plants, whether in place or not, shall be marked as rejected and immediately removed from the site of the Work and replaced with new plants at the Contractor's expense.

D. Pruning: At no time shall trees or plant materials be pruned, trimmed or topped prior to delivery and any alteration of their shape shall be conducted only with the approval and when in the presence of the Owner’s Representative.

E. Plant material shall be true to botanical and common name and variety as specified in "Annotated Checklist of Woody Ornamental Plants in California, Oregon and Washington," published by the University of California School of Agriculture (1979).

F. Nursery Grown Stock:

1. Grown under climatic conditions similar to those in locality of project.

2. Container-grown stock in vigorous, healthy condition, not root-bound or with root system hardened off.

3. Use only liner stock plant material which is well established in removable containers or formed homogenous soil sections.

2.08 SEED

A. Grass Seed: Fresh, clean, dry, new-crop seed complying with the Association of Official Seed Analysts' "Rules for Testing Seeds" for purity and germination tolerances.

B. Seed Mixture: Provide seed of grass species and varieties, proportions by weight, and minimum percentages of purity, germination, and maximum percentage of weed seed as indicated.

1. Pacific Coast Seed, “Native Erosion Control Mix” or equal
2. Seed Mix (at 45 lbs. per acre) shall consist of Bromus carinatus, Elymus glaucus, Fectuca microstachys and Trifolium willdenovii. Mixture per Seed Distributor.

C. Fiber Mulch: Biodegradable dyed-wood cellulose-fiber mulch, non-toxic, free of plant growth or germination inhibitors, with maximum moisture content of 15 percent and a pH range of 4.5 to 6.5.

D. Non-asphaltic Tackifier; Colloidal tackifier recommended by fiber-mulch manufacturer for slurry application, non-toxic and free of plant growth or germination inhibitors.

2.09 SOD

1. No sod lawn in project.

2.10 PLUGS

A. No plugs in project.

2.11 STAKING MATERIALS

A. Lodge pole tree stakes

1. Provide 2 at each new planted tree as per detail.

2. Round and uniform with chamfered top and conical point.

3. 8 or 10 foot by 2 inches as required for height of tree

4. Pressure Treated Douglas Fir

5. Secure tree with tree ties.

B. Tree Tie:

1. Arthur Enterprises: Super Tree Tie, or equal. Vinyl impregnated 1 inch Nylon, waterproof, tensile strength 300 pounds, bursting strength 300 psi.

2.12 WATER

A. Provide or use only from Owner approved utility water source.

2.13 MULCH

A. Shall be Shredded Cedar Bark as supplied by: Redi-Gro, Sacramento, Sierra Organic, Manteca, Mallard Creek, Rocklin, or equal

B. The mulch shall consist of fibrous, woody bark mixture of varied particle size such that:

PERCENT PASSING	SIEVE SIZE
90-100	25.4 mm (1 inch)
80-100	12.7 mm (1/2 inch)
20-60	6.35 mm (1/4 inch)

2.14 WOOD HEADERBOARDS

A. Headerboards shall be 2 by 4 inch pressure treated Douglas Fir or Redwood construction heart grade. Splices shall be made with 1 by 4 inch and shall not be less than 12 inches in length. Stakes shall be placed at intervals of not more than 4 feet and shall be 1 by 3 by 16 inches "construction heart redwood." All stakes shall be cut with level cut and set below top of headerboard.

B. On sharp turns and curves, four 1/2 by 4 inch laminated boards or two 1 by 4 laminated boards may be permitted.

C. Stakes and splices shall be nailed with galvanized common nails. Nail as required for solid installation.

D. Provide headerboards as shown on the Drawings and herein specified laid true to line and grade, in a workmanlike manner. Care shall be exercised in laying wood headers to protect adjacent improvements, shrubbery and other properties from damage. All stakes shall be placed on the back side of headerboard (away from turf or pavement).

2.15 METAL HEADERS

A. Metal Headers composed of steel and shall be 3/16 inch, powder-coated black or dark green, with 14 inch steel stakes. Depth shall be as follows:

1. Metal headers at tree wells shall be 4” deep.

B. Provide headers as shown on the Drawings and herein specified. They shall be laid true to line and grade, and in a workmanlike manner. Care shall be exercised in laying metal headers to protect adjacent improvements, shrubbery and other properties from damage. All stakes shall be placed on groundcover side of header.

2.16 SAND

A. Washed Silica Sand.

2.17 PLANTER DRAINAGE ROCK

A. Drainage rock shall be 1/4 inch pea gravel and shall be clean, hard, durable, uniform in quality, and free of any detrimental quantity of soft, friable, thin, elongated, or laminated pieces, disintegrated material, organic matter, oil, alkali, or other deleterious substance.

2.18 LINEAR ROOT BARRIER

A. Linear root barriers shall be Biobarrier manufactured by Typar, or equal.

B. Physical and Chemical Requirements

1. Fibers used in the manufacture of root control barrier substrate fabric shall consist of long chain synthetic polyolefins (at least 95% by weight) and a UV stabilizer. They shall be formed into a stable network such that the filaments or yarns retain their dimensional stability relative to each other.

2. Nodules consisting of trifluralin, carbon black, and polyethylene compounded in a method utilizing time-released characteristics are permanently attached to the substrate fabric on 1-1/2” centers by a through injection molding process.

3. All substrate property values, with the exception of apparent opening size (AOS), in these specifications represent minimum average roll values (MARV) in the weakest principal direction (i.e., average test results of any roll in a lot sampled for conformance or quality assurance testing shall meet or exceed the minimum values provided herein). Values for AOS represent maximum average roll values.

4. Property values for the trifluralin are average run values.

B. Panels shall measure 20’ in width with a depth of 36” unless otherwise specified.

C. Physical properties shall equal or exceed the following:

	Overall Product Major Composition and Ingredients	**Typical**
Active Chemical*:	Trifluralin (a,a,a-Trufluro 2,6 - dinitro - N,N, - Dipropyl - p - toluidine)	17.5%
Inert Ingredients	100% Spunbonded Polypropylene, Polyethylene and Carbon	82.5%

	Minimum Values		
Trifluralin Characteristics	**English**	**Metric**	**Test Method***
Unit Weight	3.9 oz/yd^2	130 g/m^2	ASTM D-5261
Grab Tensile Strength	130 lbs.	575 N	ASTM D-4632
Elongation at Break	60%	60%	ASTM D-4632
Puncture Strength	40 lbs.	175 N	ASTM D-4833
Trap Tear	60 lbs	265 N	ASTM D-4533
Permittivity	0.7 sec.	0.7 sec.	ASTM D-4491
AOS (Max Value)	0.21 mm	0.21 mm	ASTM D-4751
Ultraviolet Stability	70% @ 500 hrs	70% @ 500 hrs	ASTM D-4355

PART 3 - EXECUTION

3.01 INSPECTION

A. Obtain Owner Representative's written acceptance that planting soils have been cleaned of all construction debris, including gravel, concrete, concrete washout, paints, asphalt, etc. Refer to preparation and planting installation paragraphs of this section.

B. Obtain Owner Representative's written acceptance that final grades have been established to within 1/10 foot prior to commencing planting operations. Provide for inclusion of all amendments, settling, etc. Contractor shall be responsible for shaping all planting areas as indicated on Drawings.

C. Prior to planting, inspect trees, shrubs and liner stock plant material for injury, insect infestation and trees and shrubs for improper pruning.

D. Do not begin planting of trees until deficiencies are corrected or trees are replaced.

3.02 SOIL CLEANUP AND PREPARATION

A. Clean Up: Contractor shall review site conditions and previously completed rough grading to verify that all imported stones, stumps, gravel, concrete, asphalt, and other construction debris have been cleared from the site to a depth of 24 inches, prior to continuing project work. Contractor shall remove any and all germinated weeds.

B. Soil Cleanup, Replacement and Preparation:

1. The top 12 inches of clean (as approved by the Owner's Representative) native soil shall be lifted and removed from the site prior to general construction. Clean topsoil shall be stockpiled on site, kept clear and free of debris and rock, and then used as needed for landscaping. Place a minimum of 12 inches of clean topsoil back into all planting areas. The next lower 12 inches of soil shall be cleared of all stones, stumps, debris, etc., larger than 1/4 inch in diameter, that are brought to the surface as a result of cultivations. Cultivation shall be by rototilling or ripping equipment. Call Underground Service Alert (USA) before beginning cultivation operations.

2. In areas where building foundations have been over-excavated and re-compacted, additional mitigation measures will be required to improve soil and drainage conditions for planting. These may include, but are not limited to: the installation of subsurface drainage systems for shrub and groundcover areas and individual tree pits; removal of additional soil from the planting areas beyond what is specified above until acceptable drainage and compaction levels are achieved; aeration tubes installed; radial soil trenches dug out around each tree; or other measures as determined and approved by the Owner's Representative. Mitigation measures shall be completed by the Contractor as required at no additional cost to the Owner. See Planting Installation paragraph for more information and additional related requirements.

3. After approximate finished grades have been established, soil shall be conditioned and fertilized in the following manner. Amendments shall be uniformly spread and cultivated thoroughly by means of mechanical tiller into the top 6 inches of soil.

4. Application Rates: (Per 1,000 square feet) the following organic, soil amendments and fertilizer establish minimum requirements. Specific amendments and fertilizer amounts will be determined after rough grading operations are complete and soil samples are tested by the Contractor and approved by the Owner's Representative. The amounts listed below are considered minimum amounts for the project unless directed otherwise by the Owner's Representative.

a. Nitrogen stabilized organic amendment – 6 cubic yards for groundcover and shrub beds, 3 cubic yards for lawn areas. Owner's Representative may request delivery tags.

b. Planting fertilizer - 15 lbs.

c. Gypsum - 200 lbs.

d. Soil sulphur - 20 lbs.

e. Iron – 2 lbs.

f. Calcium carbonate – 2 lbs.

C. Final Grades:

1. All areas shall be graded so that the final grades will be 1 inch below adjacent paved areas, sidewalks, valve boxes, headers, clean-outs, drains, manholes, etc. or as indicated on Drawings.

2. Surface drainage shall be away from all building foundations.

3. Eliminate all erosion scars prior to commencing maintenance period.

D. Disposal of Excess Soil: Dispose of any unacceptable or excess soil legally at an offsite location.

3.03 PLANTING INSTALLATION

A. General

1. Only as many plants as can be planted and watered on that same day shall be distributed in a planting area.

2. Containers shall be opened and plants shall be removed in such a manner that the ball of earth surrounding the roots is not broken and they shall be planted and watered as herein specified immediately after removal from the containers. Containers shall not be opened prior to placing the plants in the planting area.

B. Pre-plant Weed Control

PART 1 - If live perennial weeds exist on site at the beginning of work, spray with a non-selective systemic contact herbicide, as recommended and applied by an approved licensed landscape pest control advisor and applicator. Leave sprayed plants intact for at least 15 days to allow systemic kill. Clear and remove these existing weeds by mowing or grubbing off all plant parts at least 1/4 inch below the surface of the soil over the entire area to be planted.

PART 2 - After irrigation system is operational, apply water for 5 to 10 days as needed to achieve weed germination. Apply contact herbicides and wait as needed before planting. Repeat, if required by Owner's Representative.

PART 3 - Maintain site weed free until final acceptance by the Owner's Representative.

C. Layout of Major Plantings: Locations for plants and outlines of areas to be planted shall be marked on the ground by Contractor before any plant pits are dug. All such locations shall be approved by the Owner's Representative. If underground construction or a utility line is encountered in the excavation of planting areas, other locations for planting may be selected by the Owner's Representative. Layout shall be accomplished with flagged grade stakes indicating plant names and specified container size on each stake.

D. Planting of Trees and Shrubs:

1. Excavation for planting shall include the stripping and stacking of all acceptable topsoil encountered within the areas to be excavated for trenches, tree holes, plant pits and planting beds.

2. Excess soil generated from the planting holes and not used as backfill or in establishing the final grades shall be removed from the site.

3. Protect all areas from excessive compaction when trucking plants or other material to the planting site.

4. All excavated holes shall have vertical sides and shall be of a size that is three times the diameter and 1 and 1/2 times the depth of the root ball for all trees and shrubs. After pits are dug, roughen the sides of the pit and loosen soil in the bottom of the pit to a depth of 3 inches. Construct foot-tamped mound in the bottom of the pit to support the plant at the proper level.

5. All prepared tree pits must be reviewed and approved by the Owner's Representative prior to the planting of any trees.

6. Percolation tests are required for 1 out of every 5 trees planted on a given site. Tree pits from each planting area of the project shall be tested for percolation. However, in areas where over-excavation of a building foundation has occurred, or any other construction practice typically resulting in extremely compacted subsoil conditions, all tree pits must be tested for percolation. Tree pits shall be filled with water and the drainage rate observed. Percolation rate shall be a minimum of the depth of the tree pit within 24 hours. If percolation/drainage rate is less than that - mitigation measures shall be implemented (see Soil Cleanup, Replacement and Preparation paragraph above) .

7. Do not handle container plants by the tops, stems or trunks at any time. Lift all plants so that the root ball is supported from the underside. Plants that do not have a satisfactory root system will be rejected. If plants do not have young feeder roots showing at the edge of the container, loosen their roots and score the root ball with a 1/2 inch deep vertical line to encourage new feeder root development.

8. Center plant in pit or trench. Crown of trees shall be 1 inch minimum above finish grade. Crown of shrubs shall be 1 inch above finish grade.

9. Face plants with fullest growth into prevailing wind.

10. Set plant plumb and hold rigidly in position until soil has been tamped firmly around ball or roots.

11. Backfill for trees and shrubs shall consist of amended native soil. If native soil is unsuitable or contaminated, use imported topsoil as specified above.

12. All plants which settle deeper than the surrounding grade shall be raised to the correct level. After the plant has been placed, additional backfill shall be added to the hole to cover approximately 1/2 of the height of the root ball. At this stage, water shall be added to the top of the partly filled hole to thoroughly saturate the root ball and adjacent soil.

13. Container Removal:

    a. Cut containers on 2 sides with a can cutter designed for the job.

    b. Do not injure root ball.

    c. Do not cut containers with spade or ax.

    d. After removing plant, superficially cut edge roots with knife on 3 sides.

14. Box Removal:

    a. Remove bottom of plant boxes before planting.

b. Remove sides of box without damage to root ball after positioning plant and partially backfilling.

15. Plant Tablets:

a. After the water has completely drained, planting tablets shall be placed as indicated below.

1) Two tablets per 1-gallon container.

2) Four tablets per 5-gallon container.

3) Six tablets per 15-gallon container.

4) Ten tablets per 24 inch box.

5) Fourteen tablets per 36 inch box.

6) Eighteen tablets per 48 inch and those box sizes which are larger.

b. Planting tablets shall be set with each plant on top of the root ball while the plants are still in their containers so the required number of tablets to be used in each hole can be easily verified by the Owner's Representative.

16. Backfill

a. The remainder of the hole shall then be backfilled with 2/3 native soil and 1/3 organic amendment thoroughly blended and tamped firm.

b. After backfilling, an earthen basin shall be constructed around each plant. Each basin shall be of a depth sufficient to hold at least 2 inches of water. The basins shall be constructed of amended backfill materials. Remove basin in all turf areas after initial watering.

17. Pruning shall be limited to the minimum necessary to remove injured twigs and branches, and to shape the plant material as directed by the Owner's Representative. Pruning shall not be done prior to delivery of plants.

18. Staking: Staking of all trees shall be completed immediately after planting. All stakes shall be installed plumb and as indicated in Drawing details.

E. Planting of Groundcovers:

1. Groundcover plants shall be grown in flats or gallon containers as indicated on the Drawings. Flat grown plants shall remain in those flats until transplanting. The flat's soil shall contain sufficient moisture so that it will not fall apart when lifting the plants.

2. Groundcover shall be planted in straight rows and evenly spaced, unless otherwise noted, and at intervals called out in the Drawings. Triangular spacing shall be used unless otherwise noted on the Drawings.

3. Each rooted plant shall be planted with its proportionate amount of flat or container soil. Plantings shall be immediately sprinkled with water after planting until the entire area is soaked to the full depth of each hole.

4. Care shall be exercised at all times to protect the plants after planting. Any damage to plants by trampling or other operations shall be repaired immediately.

F. Mulch

1. All groundcover, perennial, and shrub beds shall be dressed with a 3 inch layer of mulch, where slopes are not steeper than 2:1.

2. Pre-emergent weed control product shall be applied to all planting areas after completion of planting and prior to mulch application. Use Dimension, or equal and apply per manufacturer's recommendations.

G. Hardpan Conditions:

1. Where hardpan exists, whether it is in the form of caliche or other impervious clay, and it is within the top 2 and 1/2 feet of soil, use powered equipment to break through completely at each tree location to allow drainage and root growth. Remove hardpan at least 1 - 1/2 feet greater than the root ball diameter of tree. Backfill with soil mix as specified.

2. Where hardpan is within the first 12 inches of soil, it shall be completely penetrated for all shrubs.

3.04 HEADERBOARD INSTALLATION

A. Wood and Metal Headers:

1. Headers: Install header true to line and grade as shown on the Drawings. Align header edges and set flush with adjacent paving.

2. Stakes: Stakes shall be a minimum of 12 inches long for wood and 14 inches for metal, and longer as required for solid anchorage.

3. Header is not required where perimeter of decomposed granite is bounded by a concrete curb or slab.

4. Landscape edging is to remain in place, securely staked to hold firmly to approved line and grade.

5. After finished compacted path surface has been achieved, finish adjacent shoulder by backfilling back of header with stockpiled topsoil, compacting to match existing undisturbed ground and slope to required grade and cross section.

3.05 LINEAR ROOT BARRIER

A. General

1. Linear root barriers shall extend a minimum of 10' centered on tree trunk lying parallel with paving or utilities requiring protection.

2. Linear root barrier shall not be installed in a manner where entire root ball is encapsulated.

B. Existing Trees

1. Install linear root barrier at edge of utility trench in approximate locations shown on plan.

C. Newly Planted Trees

1. Install in locations as noted on plan.

3.06 CLEAN UP

A. During the progress of the Work, the Contractor shall keep the Project site in a neat and clean condition that is free of debris to the satisfaction of the Owner's Representative. All

materials and debris accumulated in conjunction with completing this Work shall be legally recycled or disposed of by Contractor off campus. Refer to Section 01 74 00 Cleaning and Waste Management. Remove all trash, excess soil, empty plant containers and rubbish from the property. All scars, ruts or other marks in the ground caused by this work shall be repaired and the ground left in a neat and orderly condition throughout the site.

B. The Contractor shall leave the site area broom-clean and shall wash down all walkways and other paved areas, leaving the premises in a clean and safe condition.

C. Promptly remove soil and debris created by work from paved areas and building walls. Clean wheels of vehicles before leaving site to avoid tracking soils onto surfaces of roads, walks, or other paved areas.

3.07 MAINTENANCE & PLANT ESTABLISHMENT

A. General: Maintain all plants and planting areas from time of delivery, through installation and maintenance period, until final acceptance.

B. Schedule: Submit proposed maintenance work schedule to Owner's Representative in writing for review at least 30 days prior to commencement of maintenance work. Maintenance work shall be done at times accepted by Owner.

C. Maintenance Procedures

1. General: Maintenance of new planting includes but is not limited to watering, cultivating, fertilizing, weeding, mulching, re-staking, resetting plants to proper grades or upright positions, restoring watering basins, mowing lawns to 2 inch height, removal of dead flowers and broken twigs, pest, disease and weed control, erosion control, restoring finish grades with accepted and tested imported topsoil, and taking precautions as necessary to prevent sunscald damage. Remove nursery tags and repair mulch 10 days before final acceptance.

2. Young tree pruning shall be conducted during the maintenance period by the Contractor as approved by the Owner's Representative after review by the Campus Arborist and in accordance with the Owner's standard tree pruning practices. Refer to Section 01 56 39 Tree and Plant Protection. Trees shall be pruned to encourage the growth of strong central leaders where applicable. Contractor shall notify Owner's Representative 48 hours in advance of any pruning operations.

3. Protection: Protect planting areas and plants against damage until final acceptance. Maintenance also includes temporary fences, barriers, and signs as required for protection. Treat or replace damaged plants as directed by Owner's Representative at no additional cost to Owner.

4. Fertilization: Apply potassium sulfate and 16-6-8 fertilizer at the rate of 6 pounds each per 1000 square feet, 30 days after installation.

5. Weed control:
   a. Keep site free of weeds during maintenance period.
   b. Identify weeds and apply accepted control methods.
   c. Herbicides, if used, shall be applied by licensed Pest Control Operator according to manufacturer's recommendations.

D. Observation for Maintenance Period Commencement: Request after work of this section and Section 32 84 00 Planting Irrigation is substantially complete. Maintenance Period shall begin upon written notice of acceptance by Owner's Representative and shall continue for a minimum of 90 days until final acceptance.

END OF SECTION

SECTION 33 11 16

SITE WATER UTILITY DISTRIBUTION PIPING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Section includes pipe materials, fittings, valves, fire hydrants, and back flow devices for connection to the building from the utility source.
B. Fire water lines & pump will be a deferred submittal on the project.

1.02 RELATED SECTIONS

A. Section 31 23 33 Trenching and Backfilling

1.03 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Section 01 42 00 for definitions, acronyms, and abbreviations.

B. Unless otherwise noted, standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes as of the date of issue of this Project Manual.

C. Referenced Standards:

1. CalTrans Standard Specifications.

2. American Association of State Highway and Transportation Officials

3. National Precast Concrete Association:

4. NPCA Quality Control Manual for Precast Plants.

5. NPCA Plant Certification Program.

6. American Society of Mechanical Engineers:

   a. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.

   b. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

7. American Society for Testing and Materials:

   a. ASTM B32 – Standard Specification for Solder Filler Material.

   b. ASTM B813 – Standard Specification for Soldering Flux.

   c. ASTM B828 – Standard Specification for Copper Tubing Soldered Joints.

   d. ASTM D1785 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.

e. ASTM D2466 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.

f. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.

g. ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.

h. ASTM F645 – Standard Specification for Selection, Design, and Installation of Thermoplastic Water Piping.

8. American Water Works Association:

a. AWWA C111 - American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

b. AWWA C151 - American National Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water.

c. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.

d. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 in. through 12 in., for Water Distribution.

9. Copper Development Association:

10. Copper Tube Handbook.

11. Underwriters Laboratories Inc.:

12. UL 246 - Hydrants for Fire - Protection Service.

13. Fire Protection Equipment Directory.

1.04 DEFINITIONS

A. Water-Distribution Piping: Exterior domestic or fire water piping.

B. Water Service: Exterior domestic and fire water services, owned and maintained by the California Water Service Company up to the water meter.

C. The following are industry abbreviations for plastic materials:

1. PVC: Polyvinyl chloride plastic.

1.05 SUBMITTALS

A. Product Data: Submit data for the following:

1. Piping specialties.

2. Valves and accessories.

3. Water meters and accessories.

4. Hydrants.

B. Field Quality-Control Test Reports: From Contractor.

C. Operation and Maintenance Data: For specialties to include in emergency, operation, and maintenance manuals. Closeout Procedures include the following:

1. Water meters.

2. Valves.

3. Protective enclosures.

4. Hydrants as indicated.

1.06 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of piping mains, valves, connections, thrust restraints, and invert elevations.

B. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.07 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of piping and specialties and are based on the specific system indicated.

B. Piping materials shall bear label, stamp, or other markings of specified testing agency.

C. Comply with ASTM F 645 for selection, design, and installation of thermoplastic water piping.

D. Comply with FM's "Approval Guide" or UL's "Fire Protection Equipment Directory" for fire-service-main products.

E. NSF Compliance:

1. Comply with NSF 61 for materials for water-service piping and specialties for domestic water.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Preparation for Transport: Prepare valves, including fire hydrants, according to the following:

1. Ensure that valves are dry and internally protected against rust and corrosion.

2. Protect valves against damage to threaded ends and flange faces.

3. Set valves in best position for handling. Set valves closed to prevent rattling.

B. During Storage: Use precautions for valves, including fire hydrants, according to the following:

1. Do not remove end protectors unless necessary for inspection; then reinstall for storage.

2. Protect from weather. Store indoors and maintain temperature higher than ambient dew-point temperature. Support off the ground or pavement in watertight enclosures when out-

door storage is necessary.

C. Handling: Use sling to handle valves and fire hydrants if size requires handling by crane or lift. Rig valves to avoid damage to exposed parts. Do not use hand-wheels or stems as lifting or rigging points.

D. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.

E. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.

F. Protect flanges, fittings, and specialties from moisture and dirt.

G. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

1.09 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Owner not less than two days in advance of proposed utility interruptions.

2. Do not proceed with utility interruptions without Owner's and written permission.

1.10 COORDINATION

A. Coordinate connection to water main with CalWater.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products specified.

2.02 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

B. PVC Pipe: ASTM D1785, Schedule 40.

1. Fittings: ASTM D2466, PVC.

2. Joints: ASTM D2855, solvent weld.

C. PVC Pipe: AWWA C900 DR14 Class 200. (to be used for fire water lines on the project)

1. Fittings: AWWA C111, cast iron.

2. Joints: ASTM D3139 compression gasket ring.

2.03 DUCTILE-IRON PIPE AND FITTINGS

A. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151, with mechanical-joint, bell- and plain-spigot end unless grooved or flanged ends are indicated.

1. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.

a. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

B. Push-on-Joint, Ductile-Iron Pipe: AWWA C151, with push-on-joint, bell- and plain-spigot end unless grooved or flanged ends are indicated.

1. Push-on-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.

a. Gaskets: AWWA C111, rubber.

C. Ductile-Iron Flexible Expansion Joints: Compound, ductile-iron fitting with combination of flanged and mechanical-joint ends complying with AWWA C110 or AWWA C153. Include two gasketed ball-joint sections and one or more gasketed sleeve sections. Assemble components for offset and expansion indicated. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.

D. Ductile-Iron Deflection Fittings: Compound, ductile-iron coupling fitting with sleeve and flexing sections for up to 20-degree deflection, gaskets, and restrained-joint ends complying with AWWA C110 or AWWA C153. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.

E. Ductile-Iron Expansion Joints: Three-piece, ductile-iron assembly consisting of telescoping sleeve with gaskets and restrained-type, ductile-iron, bell-and-spigot end sections complying with AWWA C110 or AWWA C153. Select and assemble components for expansion indicated. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.

2.04 COPPER TUBE AND FITTINGS

A. Soft Copper Tube:

1. Copper Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint pressure type. Furnish only wrought-copper fittings if indicated.

B. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

2.05 JOINING MATERIALS

A. Transition Couplings:

1. Underground Piping, NPS 1-1/2 (DN 40) and Smaller: Manufactured fitting or coupling same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

2. Aboveground or Vault Piping: Pipe fitting same size as, with pressure rating at least equal

to and ends compatible with, piping to be joined.

B. Brazing Filler Metals: AWS A5.8, BCuP Series.

C. Soldering Flux: ASTM B 813, water-flushable type.

D. Solder Filler Metal: ASTM B 32, lead-free type with 0.20 percent maximum lead content.

2.06 GATE VALVES

A. AWWA, Cast-Iron Gate Valves:

1. Available Manufacturers:

a. American AVK Co.; Valves & Fittings Div.

b. American Cast Iron Pipe Co.; American Flow Control Div.

c. American Cast Iron Pipe Co.; Waterous Co. Subsidiary.

d. Crane Co.; Crane Valve Group; Stockham Div.

e. East Jordan Iron Works, Inc.

f. Grinnell Corporation; Mueller Co.; Water Products Div.

g. McWane, Inc.; Clow Valve Co. Div. (Oskaloosa).

h. McWane, Inc.; Kennedy Valve Div.
i. McWane, Inc.; Tyler Pipe; Utilities Div.

j. NIBCO INC.

k. United States Pipe and Foundry Company.

2. Nonrising-Stem, Resilient-Seated Gate Valves: AWWA C509, gray- or ductile-iron body and bonnet; with bronze or gray- or ductile-iron gate, resilient seats, bronze stem, and stem nut.

a. Minimum Working Pressure: 200 psig.

b. End Connections: Mechanical joint.

c. Interior Coating: Complying with AWWA C550.

2.07 GATE VALVE ACCESSORIES AND SPECIALTIES

A. Valve Boxes: Comply with AWWA M44 for cast-iron valve boxes. Include top section, adjustable extension of length required for depth of burial of valve, plug with lettering "WATER," bottom section with base of size to fit over valve, and approximately 5-inch diameter barrel.

1. Operating Wrenches: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and socket matching valve operating nut.

2.08 WATER METERS

A. Water meters will be furnished by CalWater.

2.09 FREESTANDING FIRE HYDRANTS

A. Dry-Barrel Fire Hydrants: UL 246, FM-approved, one NPS 4-1/2 (DN 115) and two NPS 2-1/2 (DN 65) outlets, 5-1/4-inch main valve, drain valve, and NPS 6 (DN 150) mechanical-joint inlet. Hydrant shall have cast-iron body, compression-type valve opening against pressure and closing with pressure, and 150-psig minimum working-pressure design.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify building service connection and municipal utility water main size, location, and invert are as indicated on Drawings.

3.02 PREPARATION

A. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare pipe connections to equipment with flanges or unions.

3.03 BEDDING

A. Excavate pipe trench in accordance with Section 31 23 33 – trenching and backfilling

3.04 PIPING APPLICATIONS

A. General: Use pipe, fittings, and joining methods for piping systems according to the following applications.

B. Transition couplings and special fittings with pressure ratings at least equal to piping pressure rating may be used in applications below, unless otherwise indicated.

C. Do not use flanges, unions, or keyed couplings for underground piping.

D. Flanges, unions, keyed couplings, and special fittings may be used, instead of joints indicated, on aboveground piping and piping in vaults.

E. Underground Water-Distribution Piping: Use the following piping materials for each size range:

1. NPS 3/4 to NPS 3 (DN 20 to DN 75): Soft copper tube, Type K (Type A) and soldered joints, or Schedule 40 PVC.

2. NPS 4 to 12 (DN 100 to DN 300): Ductile-iron or Class 200 PVC, mechanical joint pipe.

3.05 VALVE APPLICATIONS

A. General Application: Use mechanical-joint-end valves for NPS 3 (DN 80) and larger underground installation. Use threaded- or flanged-end valves for installation in vaults. Use UL/FM, non-rising-stem gate valves for installation with indicator posts. Use corporation valves and curb valves with

ends compatible with piping, for NPS 2 (DN 50) and smaller installation.

B. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Underground Valves, NPS 3 (DN 80) and Larger: AWWA, cast-iron, non-rising-stem, resilient-seated gate valves with valve box.

3.06 JOINT CONSTRUCTION

A. Make pipe joints according to the following:

1. Ductile-Iron Piping, Gasketed Joints for Water-Service Piping: AWWA C600 and AWWA M41.

2. Copper Tubing Soldered Joints: ASTM B 828. Use flushable flux and lead-free solder.

3. Dissimilar Materials Piping Joints: Use adapters compatible with both piping materials, with OD, and with system working pressure.

4. PVC, ASTM D3139 compression gasket ring.

3.07 PIPING INSTALLATION

A. Water-Main Connection: Arrange with CalWater.

B. Install PVC, water-service piping according to AWWA C900 and AWWA M23.

C. Install ductile-iron, water-service piping according to AWWA C600 and AWWA M41.

1. Install PE corrosion-protection encasement according to ASTM A 674 or AWWA C105.

D. Install copper tube and fittings according to CDA's "Copper Tube Handbook."

E. Bury piping with depth of cover over top at least 30 inches, with top at least 12 inches below level of maximum frost penetration, and according to the following:

1. Under Driveways: With at least 36 inches cover over top.

2. In Loose Gravelly Soil and Rock: With at least 12 inches additional cover.

F. Install piping by tunneling, jacking, or combination of both, under streets and other obstructions that cannot be disturbed.

G. Extend water-service piping and connect to water-supply source and building water piping systems at outside face of building wall in locations and pipe sizes indicated.

1. Terminate water-service piping at building wall until building water piping systems are installed. Terminate piping with caps, plugs, or flanges as required for piping material. Make connections to building water piping systems when those systems are installed.

H. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.

I. Anchor service-entry piping to building wall.

J. Install water-supply piping with shutoff valve in water supply to each post hydrant and drinking fountain. Use curb valve and service box.

3.08 ANCHORAGE INSTALLATION

A. Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches. Include anchorages for the following piping systems:

1. Gasketed-Joint, Ductile-Iron, Water-Service Piping: According to AWWA C600.

2. PVC piping: According to AWWA M23.

B. Apply full coat of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.

3.09 VALVE INSTALLATION

A. AWWA Gate Valves: Comply with AWWA C600 and AWWA M44. Install each underground valve with stem pointing up and with valve box.

3.10 WATER-METER INSTALLATION

A. Water meters will be installed by CalWater.

3.11 FIRE HYDRANT INSTALLATION

A. General: Install each fire hydrant with separate gate valve in supply pipe, anchor with restrained joints or thrust blocks, and support in upright position.

B. AWWA-Type Fire Hydrants: Comply with AWWA M17.

3.12 CONNECTIONS

A. Connect water-distribution piping to service provided by California Water Service Company.

B. Connect water-distribution piping to interior domestic-water and fire-suppression piping.

3.13 FIELD QUALITY CONTROL

A. Piping Tests: Conduct piping tests before joints are covered and after thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.

B. Hydrostatic Tests: Test at not less than 1-1/2 times working pressure for 2 hours.

1. Increase pressure in 50-psig increments and inspect each joint between increments. Hold at test pressure for 1 hour; decrease to 0 psig. Slowly increase again to test pressure and hold for 1 more hour. Maximum allowable leakage is 2 quarts per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.

C. Prepare reports of testing activities.

3.14 IDENTIFICATION

A. Install continuous underground warning tape during backfilling of trench for underground water-service piping. Locate below finished grade, directly over piping.

3.15 CLEANING

A. Clean and disinfect water-distribution piping as follows:

1. Purge new water-distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use.

2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in NFPA 24 for flushing of piping. Flush piping system with clean, potable water until dirty water does not appear at points of outlet.

3. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in AWWA C651 or as described below:

   a. Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine; isolate and allow to stand for 24 hours.

   b. Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow to stand for 3 hours.

   c. After standing time, flush system with clean, potable water until no chlorine remains in water coming from system.

   d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.

B. Prepare reports of purging and disinfecting activities.

END OF SECTION

SECTION 33 41 00
STORM UTILITY DRAINAGE PIPING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Storm drainage piping, fittings, and accessories (gravity systems only).

B. Connection of drainage system to existing drainage system.

C. Inlets and Cleanouts.

1.02 RELATED SECTIONS

A. Section 31 23 33 Trenching and Backfilling

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM) A 746 - Standard Specification for Ductile Iron Gravity Sewer Pipe; 2003.

B. ASTM D 3034 - Standard Specification for Type PSM Poly Vinyl Chloride (PVC) Sewer Pipe and Fittings; 2004a.

C. ASTM D 2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications; 2005.

D. American Water Works Association (AWWA) C111/A21.11 – American National Standard for Rubber Gasket Joints For Cast Iron and Ductile Iron Pressure Pipe and Fittings; 2000.

1.04 DEFINITIONS

A. Bedding: Fill placed under, beside and directly over pipe, prior to subsequent backfill operations.

1.05 SUBMITTALS

A. Product Data: Provide data acknowledging that products meet requirements of standards referenced.

B. Manufacturer's Installation Instructions: Indicate special procedures required to install Products specified.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. **Project Record Documents:**

1. Record location of pipe runs, connections, inlets, cleanouts, manholes and invert elevations.

2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

PART 2 – PRODUCTS

2.01 DRAINAGE PIPE MATERIALS

A. Plastic Pipe: ASTM D 3034, Type PSM, SDR 35, Poly Vinyl Chloride (PVC) material; inside nominal diameter as indicated on Drawings.

B. Plastic Pipe Joint Seals: ASTM D 3212 PVC elastomeric joints using elastomeric seals complying with ASTM F 477.

C. Ductile Iron Pipe: A 746; inside nominal diameter as indicated on Drawings.

D. Ductile Iron Pipe Joint Seals: AWWA C111/A21.11 rubber gaskets.

E. Corrugated High Density Polyethylene Pipe (CPEP): Pipe shall have a smooth interior and annular exterior corrugations. Pipe and fitting material shall be high density polyethylene meeting ASTM D3350 minimum cell classification 324420C for 4-10 inches diameters or 335420C for 12-60 inches diameters. Pipes 4-10 inches in diameter shall meet American Association of State Transportation Officials (AASHTO) M252, Type S, and 12-48 inches diameter shall meet AASHTO M294, Type S. Pipe material shall be a slow crack resistance material evaluated using the single point notched constant tensile load (SP-NCTL) test. Average SP-NCTL test specimens must exceed 24 hours with no test result less than 17 hours.

F. Corrugated High Density Polyethylene Pipe (CPEP) Joint Device: Bell-and-spigot meeting AASHTO M252, AASHTO M294 or MP7. Joints shall be silt-tight and non-rated watertight. Gaskets shall be made of polyisoprene meeting the requirements of ASTM F477 with the addition that the gaskets shall not have any visible cracking when tested according to ASTM D1149 after 72-hour exposure in 50 PPHM ozone at 104 degrees F.

G. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required.

H. Cast Iron Pipe: Hubless Cast Iron pipe and fittings shall be manufactured from gray cast iron and shall conform to ASTM A 888 and CISPI Standard 301. All pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute® and listed by NSF® International. Hubless Couplings shall conform to CISPI Standard 310, shall be manufactured in the United States, and be certified by NSF® International. Heavy Duty and Medium Duty couplings shall conform to ASTM C 1540, shall be manufactured in the United States, and shall be used if indicated.

I. Joints: Joints shall be PVC specified in ASTM D3212, elastomeric joints using elastomeric seals complying with ASTM F477.

J. Fittings: Fittings shall be Husky SD 4000 for waste, and Husky 2000 for vent and conform to ASTM C-1540.

2.02 PIPE ACCESSORIES

A. Line Marker: Provide line markers in accordance with Section 33 05 26 Utility Line Signs, Markers, and Flags

2.03 CLEANOUTS AND CATCH BASINS

A. Cleanouts and Catch Basins: As indicated on Drawings.

2.04 BEDDING AND COVER MATERIALS

A. Pipe Bedding Material: As specified in Section 31 23 33 Trenching and Backfilling.

B. Pipe Cover Material: As specified in Section 31 23 33 Trenching and Backfilling.

PART 3 EXECUTION

3.01 TRENCHING

A. See Section 31 23 33 Trenching and Backfilling for additional requirements.

B. Hand trim excavation for accurate placement of pipe to elevations indicated.

C. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

3.02 INSTALLATION - PIPE

A. Lay piping beginning at low point of system, true to grades and alignment indicated on Drawings, with unbroken continuity of invert.

B. Install pipe, fittings, and accessories in accordance with manufacturer's instructions. Seal watertight.

1. Plastic Pipe: Also comply with ASTM D 2321.

C. Lay pipe to slope gradients noted on layout drawings; with maximum variation from true slope of 1/8 inch in 10 feet.

D. Install continuous line marker 18 inches above top of pipe; coordinate with Section 31 23 33 Trenching and Backfilling.

3.03 INSTALLATION - CATCH BASINS

A. Provide as recommended by manufacturer.

3.04 PIPE PENETRATIONS

A. For pipe penetrations through existing manholes, core through, provide gasket around pipe, grout penetration on both sides and provide a minimum of 6 inches around collar outside of the manhole or inlet structure penetration.

3.05 TAP CONNECTIONS

A. Make connections to existing piping and underground structures so that finished Work will conform as nearly as practicable to requirements specified for new Work.

B. Into underground structures or pipes 24 inches and larger: Cut opening into unit sufficiently large to allow 3 inches of concrete to be packed around entering connection. Cut ends of connection passing through pipe or structure wall to conform to shape of and be flush with inside wall. On outside of pipe or structure wall, encase entering connection in 6 inches of concrete for minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground. Provide 3000 pounds per square inch concrete. Use epoxy bonding compound as interface between new and existing concrete and piping materials.

C. Take care while making tap connections to prevent concrete or debris from entering existing

pipe or structure. Remove debris, concrete, or other extraneous material, which may accumulate.

3.06 CLEANING

A. Piping greater than 6 inches: clean pipe to be tested by propelling a snug fitting inflated rubber ball through the pipe with water to remove any debris.

B. Piping 6 inches and smaller: flush piping applying full size pipe flushing.

3.07 LEAK TESTING

A. Testing of all portions of the sewer including manholes is required.

B. For either exfiltration or infiltration test, the maximum leakage shall not exceed 250 gallons per inch of pipe diameter per mile per 24 hours as measured over a period of 30 minutes minimum. Should the leakage exceed the maximum allowable rate, the contractor shall repair, overhaul, or rebuild the defective portion of the sewer line. After repairs have been completed by the Contractor, the line shall be retested as specified above.

C. Manholes shall be filled with water to the rim of the frame casting and shall lose no more than 2 inches over a period of 30 minutes.

D. The final test shall be performed after the line has been laid and all backfill placed and compacted. The Contractor, at Contractor's option, may test the line at any time during construction. However, the final test for acceptance shall be made only after all backfill is in place and compacted. In the event that the exfiltration test prescribed above is impractical due to wet trench conditions, these portions of the sewer line where such conditions are encountered will be tested for infiltration. The Owner's Representative shall determine whether the exfiltration or infiltration test will be used.

E. Even though the test for leakage is within the prescribed limits, the Contractor shall repair any obvious leaks.

F. Low pressure air testing may be used in lieu of water testing at the option of the Contractor. Water testing may be required by the Owner's Representative. The following procedure shall be used for air testing:

1. Plug all pipe outlets with suitable test plugs. Brace each plug securely.

2. If the pipe to be tested is submerged in ground water, insert a pipe probe, by boring or jetting, into the backfill material adjacent to the center of the pipe, and determine the pressure in the probe when air passes slowly through it. This is the back pressure due to ground water submergence over the end of the probe. All gauge pressures in the test should be increased by this amount.

3. Add air slowly to the portion of the pipe installation under test until the internal pressure is raised to 5.0 psig.

4. Check exposed pipe and plugs for abnormal leakage by coating with a soap solution. If any leakage is observed, bleed off air and make necessary repairs.

5. After an internal pressure of 5.0 psig. is obtained, allow at least two minutes for air temperature to stabilize, adding only the amount of air required to maintain pressure.

6. After the two minute period, disconnect the air supply and start stopwatch. The pressure

of 5.0 psig. shall be maintained for 5 minutes.

7. As an alternate, the contractor may request the air testing procedure as presented in Section 306-1.4.4 of the 1997 edition of the “Greenbook” Standard Specifications.

END OF SECTION 33 41 00