

**DEPARTMENT OF VETERANS AFFAIRS
VHA MASTER SPECIFICATIONS**

**TABLE OF CONTENTS
Section 00 01 10**

SECTION NO.	DIVISION AND SECTION TITLES	DATE
	DIVISION 00 - SPECIAL SECTIONS	
00 01 10	Table of Contents <i>*REVISED 02/03/2023*</i>	02-23
00 01 15	List of Drawing Sheets	05-20
	DIVISION 01 - GENERAL REQUIREMENTS	
01 00 00	General Requirements <i>*REVISED 02/03/2023*</i>	02-23
01 32 16.15	Project Schedules (Small Projects – Design/Bid/Build	03-20
01 33 23	Shop Drawings, Product Data, and Samples	05-17
01 35 26	Safety Requirements	07-20
01 42 19	Reference Standards	09-19
01 45 00	Quality Control	03-19
01 45 29	Testing Laboratory Services	11-18
01 57 19	Temporary Environmental Controls	01-11
01 74 19	Construction Waste Management	09-13
01 81 13	Sustainable Construction Requirements	10-17
01 91 00	General Commissioning Requirements	10-15
	DIVISION 02 – EXISTING CONDITIONS	
02 41 00	Demolition	08-17
	DIVISION 03 – CONCRETE	
03 30 00	Cast-in-Place Concrete <i>*REVISED 02/03/2023*</i>	02-23
03 45 00	Precast Architectural Concrete	02-19
	DIVISION 04 – MASONRY	
04 05 13	Masonry Mortaring	10-17
04 05 16	Masonry Grouting	02-16
04 26 13	Masonry Veneer	
	DIVISION 05 – METALS	
05 12 00	Structural Steel Framing	11-18
05 21 00	Steel Joist Framing	11-18
05 31 00	Steel Decking	02-16

SECTION NO.	DIVISION AND SECTION TITLES	DATE
05 40 00	Cold-Formed Metal Framing	05-16
05 44 00	Cold-Formed Metal Trusses	
05 50 00	Metal Fabrications	08-18
	DIVISION 06 – WOOD, PLASTICS AND COMPOSITES	
06 10 00	Rough Carpentry	10-17
06 16 00	Sheathing	
06 20 00	Finish Carpentry	08-16
	DIVISION 07 - THERMAL AND MOISTURE PROTECTION	
07 13 00	Sheet Waterproofing	04-13
07 13 52	Modified Bituminous Sheet Waterproofing	08-16
07 21 13	Thermal Insulation	10-17
07 22 00	Roof and Deck Insulation	02-16
07 24 00	Exterior Insulation and Finish Systems	02-16
07 27 26	Fluid-Applied Membrane Air Barrier, Vapor Permeable	02-16
07 31 13	Asphalt Shingles	02-16
07 40 00	Roofing and Siding Panels	01-21
07 54 23	Thermoplastic Polyolefin (TPO) Roofing	08-16
07 71 00	Roof Specialties	10-15
07 72 00	Roof Accessories	10-15
07 81 00	Applied Fireproofing	10-17
07 84 00	Firestopping	02-16
07 92 00	Joint Sealants	10-17
	DIVISION 08 - OPENINGS	
08 11 13	Hollow Metal Doors and Frames	08-16
08 14 00	Interior Wood Doors	02-16
08 14 73	Interior Sliding Doors	
08 17 10	Integrated Door Assemblies	02-16
08 31 13	Access Doors and Frames	02-16
08 34 53	Security Doors and Frames	05-15
08 34 59	Vault Doors and Day Gates	02-16
08 41 13	Aluminum-Framed Entrances and Storefronts	08-16
08 51 13	Aluminum Windows	04-20
08 56 53	Blast Resistant Windows	02-16
08 71 00	Builder's Hardware	04-20
08 71 13	Automatic Door Operators	02-16
08 71 13.11	Low Energy Power Assist Door Operators	08-16

SECTION NO.	DIVISION AND SECTION TITLES	DATE
08 80 00	Glazing	10-15
08 84 00	Plastic Glazing	
08 90 00	Louvers and Vents	05-15
	DIVISION 09 – FINISHES	
09 05 16	Subsurface Preparation for Floor Finishes	02-15
09 06 00	Schedule for Finishes	04-15
09 22 16	Non-Structural Metal Framing	06-18
09 29 00	Gypsum Board	10-15
09 30 13	Ceramic/Porcelain Tiling	09-15
09 51 00	Acoustical Ceilings	12-18
09 54 26	Suspended Wood Ceiling	
09 65 13	Resilient Base and Accessories	02-16
09 65 16	Resilient Sheet Flooring	05-18
09 65 19	Resilient Tile Flooring	05-18
09 68 00	Carpeting	10-15
09 72 00	Digitally Printed Wall Covering Mural	
09 91 00	Painting	01-16
	DIVISION 10 – SPECIALTIES	
10 11 23	Tackboards	10-15
10 13 00	Directories	05-15
10 14 00	Signage	10-15
10 21 23	Cubicle Curtain Tracks <i>*REVISED 02/03/2023*</i>	02-23
10 26 00	Wall and Door Protection	10-15
10 28 00	Toilet, Bath, and Laundry Accessories	02-16
10 44 13	Fire Extinguisher Cabinets	08-18
10 75 00	Flagpoles <i>*DELETED 02/03/2023*</i>	02-16
	DIVISION 11 – EQUIPMENT	
11 73 00	Ceiling Mounted Patient Lift System	01-17
	DIVISION 12 – FURNISHINGS	
12 31 00	Manufactured Metal Casework	05-15
12 32 00	Manufactured Wood Casework	09-15
12 36 00	Countertops	12-18
	DIVISION 13 - SPECIAL CONSTRUCTION	
13 05 41	Seismic Restraint Requirements for Non-Structural Components	01-14

SECTION NO.	DIVISION AND SECTION TITLES	DATE
	DIVISION 21- FIRE SUPPRESSION	
21 13 13	Wet-Pipe Sprinkler Systems	06-15
	DIVISION 22 – PLUMBING	
22 05 11	Common Work Results for Plumbing	07-16
22 05 12	General Motor Requirements for Plumbing Equipment	09-15
22 05 19	Meters and Gauges for Plumbing Piping	09-15
22 05 23	General-Duty Valves for Plumbing Piping	09-15
22 07 11	Plumbing Insulation	09-19
22 11 00	Facility Water Distribution	11-19
22 11 23	Domestic Water Pumps	09-15
22 13 00	Facility Sanitary and Vent Piping	09-15
22 14 00	Facility Storm Drainage	09-15
22 35 00	Domestic Water Heat Exchangers	12-16
22 40 00	Plumbing Fixtures	09-15
	DIVISION 23 – HEATING, VENTILATING, AND AIR CONDITIONING (HVAC)	
23 05 11	Common Work Results for HVAC	02-20
23 05 12	General Motor Requirements for HVAC and Steam Generation Equipment	02-20
23 05 41	Noise and Vibration Control for HVAC Piping and Equipment	02-20
23 05 93	Testing, Adjusting, and Balancing for HVAC	02-20
23 07 11	HVAC and Boiler Plant Insulation	02-20
23 09 23	Direct-Digital Control System for HVAC	09-11
23 21 13	Hydronic Piping	02-20
23 21 23	Hydronic Pumps	02-20
23 25 00	HVAC Water Treatment	02-20
23 31 00	HVAC Ducts and Casings	02-20
23 34 00	HVAC Fans	02-20
23 36 00	Air Terminal Units	02-20
23 37 00	Air Outlets and Inlets	02-20
23 74 13	Packaged, Outdoor, Central-Station Air-Handling Units	03-20
23 81 23	Computer-Room Air-Conditioners	03-20
23 82 00	Convection Heating and Cooling Units	03-20
23 82 16	Air Coils	03-20
	DIVISION 25 – INTEGRATED AUTOMATION	

SECTION NO.	DIVISION AND SECTION TITLES	DATE
25 10 10	Advanced Utility Metering System	02-10
	DIVISION 26 – ELECTRICAL	
26 05 11	Requirements for Electrical Installations	01-16
26 05 13	Medium-Voltage Cables	01-17
26 05 19	Low-Voltage Electrical Power Conductors and Cables	01-17
26 05 26	Grounding and Bonding for Electrical Systems	01-17
26 05 33	Raceway and Boxes for Electrical Systems	01-18
26 05 39	Underfloor Raceways for Electrical Systems	01-18
26 05 41	Underground Electrical Construction <i>*ADDED 02/03/2023*</i>	02-23
26 05 73	Overcurrent Protective Device Coordination Study	01-18
26 12 19	Pad-Mounted, Liquid-Filled, Medium-Voltage Transformers <i>*REVISED 02/03/2023*</i>	02-23
26 24 13	Distribution Switchboards	01-18
26 24 16	Panelboards	01-18
26 27 26	Wiring Devices	01-18
26 29 21	Enclosed Switches and Circuit Breakers	01-17
26 43 13	Surge Protective Devices	01-17
26 51 00	Interior Lighting	01-18
26 56 00	Exterior Lighting	01-18
	DIVISION 27 – COMMUNICATIONS	
27 05 11	Requirements for Communications Installations	09-19
27 05 26	Grounding and Bonding for Communications Systems	06-15
27 05 33	Raceways and Boxes for Communications Systems <i>*REVISED 02/03/2023*</i>	02-23
27 10 00	Control, Communication and Signal Wiring	06-15
27 11 00	Telecommunications Room Fittings	06-15
27 15 00	Communications Structured Cabling <i>*REVISED 02/03/2023*</i>	02-23
27 52 23	Nurse Call and Code Blue Systems <i>*REVISED 02/03/2023*</i>	02-23
	DIVISION 28 – ELECTRONIC SAFETY AND SECURITY	
28 05 00	Common Work Results for Electronic Safety and Security	04-18
28 05 13	Conductors and Cables for Electronic Safety and Security	10-18
28 05 26	Grounding and Bonding for Electronic Safety and Security	09-11
28 05 28.33	Conduits and Backboxes for Electronic Safety and Security	09-11
28 13 00	Physical Access Control System	10-11
28 23 00	Video Surveillance	09-11
28 31 00	Fire Detection and Alarm	10-11

SECTION NO.	DIVISION AND SECTION TITLES	DATE
	DIVISION 31 – EARTHWORK	
31 20 00	Earthwork	07-16
	DIVISION 32 – EXTERIOR IMPROVEMENTS	
32 05 23	Cement and Concrete for Exterior Improvements	08-16
32 12 16	Asphalt Paving	09-15
32 17 23	Pavement Markings	08-16
32 84 00	Planting Irrigation	08-16
32 90 00	Planting	08-16
	DIVISION 33 – UTILITIES	
33 10 00	Water Utilities	03-17
33 30 00	Sanitary Sewer Utilities	06-13
33 40 00	Storm Sewer Utilities	12-17
	DIVISION 34 – TRANSPORTATION	
34 71 13	Passive Vehicle Barriers	04-18
	DIVISION 48 – Electrical Power Generation	
48 14 00	Solar Energy Electrical Power Generation System	10-17

APPENDIX A: GEOTECHNICAL ENGINEERING REPORT

APPENDIX B: CONSTRUCTION SIGN DETAIL

APPENDIX C: PATIENT LIFT DETAILS

APPENDIX D: TOPOGRAPHIC SURVEY **(NOT INCLUDED)**

APPENDIX E: INADVERTENT DISCOVERY PLAN (IDP)

APPENDIX F: PHYSICAL SECURITY NARRATIVE & BLAST CALCULATIONS

(BLAST CALCULATIONS NOT INCLUDED)

APPENDIX G: STORM DRAINAGE REPORT **(NOT INCLUDED)**

APPENDIX H: MECHANICAL & PLUMBING CALCULATIONS **(NOT INCLUDED)**

APPENDIX I: STRUCTURAL CALCULATIONS **(NOT INCLUDED)**

SECTION 00 01 15
LIST OF DRAWING SHEETS

The drawings listed below accompanying this specification form a part of the contract.

<u>Drawing No.</u>	<u>Title</u>
GENERAL	
G-001	COVER SHEET
G-002	DRAWING INDEX
GS101	ARCHITECTURAL SITE PLAN
GS201	FIRE AND LIFE SAFETY
CIVIL	
C-100	CIVIL COVER SHEET
CG200	TEMPORARY EROSION AND SEDIMENT CONTROL PLAN
CG210	TEMPORARY EROSION AND SEDIMENT CONTROL DETAILS
CD300	SITE DEMOLITION PLAN
CU400	UTILITY PLAN
CU410	UTILITY PROFILES
CG500	GRADING AND STORM DRAINAGE PLAN
CG510	STORM DRAINAGE PROFILES
CG520	STORM DRAINAGE DETAILS
CG521	STORM DRAINAGE DETAILS
CG530	GRADING ENLARGEMENTS
CP600	PAVING AND HORIZONTAL CONTROL PLAN
CP610	PAVING DETAILS
LANDSCAPE	
LS101	BUILDING SITE PLAN
LS102	BUILDING LANDSCAPE DETAILS
LI101	IRRIGATION DEMO PLAN

LI102	BUILDING DIAGRAMATIC IRRIGATION PLAN
LI103	BUILDING IRRIGATION DETAILS

STRUCTURAL

S-000	TITLE SHEET
S-001	GENERAL STRUCTURAL NOTES
S-002	SPECIAL INSPECTIONS 1 OF 2
S-003	SPECIAL INSPECTIONS 2 OF 2
SB201	FOUNDATION PLAN
SF202	FLAT ROOF PLAN
SF203	HIGH ROOF PLAN
SE301	BUILDING ELEVATIONS
SE302	BUILDING ELEVATIONS
SE303	FRAME ELEVATIONS
SE304	FRAME ELEVATIONS
SS311	BUILDING SECTIONS
SS312	BUILDING SECTIONS
SS313	BUILDING SECTIONS
SS314	WALL SECTIONS
SS315	WALL SECTIONS
SS316	WALL SECTIONS
SS317	WALL SECTIONS
SD401	CONCRETE DETAILS
SD402	CONCRETE DETAILS
SD501	STEEL DETAILS
SD502	STEEL DETAILS
SD503	STEEL DETAILS
SD504	STEEL DETAILS
SD505	STEEL DETAILS
SD510	METAL DECK DETAILS
SD601	COLD FORMED STEEL DETAILS

SD602 COLD FORMED STEEL DETAILS

ARCHITECTURAL

A-001	SYMBOLS & ABBREVIATIONS
A-101	FLOOR PLAN
A-102	ROOF PLAN
A-114	PENTHOUSE FLOOR PLAN
AC101	REFLECTED CEILING PLAN
AE201	EXTERIOR ELEVATIONS
AE202	EXTERIOR ELEVATIONS
AE301	BUILDING SECTIONS
AE302	BUILDING SECTIONS
AE303	BUILDING SECTIONS
A-401	PARTIAL FLOOR PLAN – EAST
A-402	PARTIAL FLOOR PLAN – CENTER
A-403	PARTIAL FLOOR PLAN – WEST
A-404	PARTIAL FLOOR PLAN – EAST – DIMENSIONS
A-405	PARTIAL FLOOR PLAN – CENTER – DIMENSIONS
A-406	PARTIAL FLOOR PLAN – WEST – DIMENSIONS
AC401	PARTIAL REFLECTED CEILING PLAN – EAST
AC402	PARTIAL REFLECTED CEILING PLAN – CENTER
AC403	PARTIAL REFLECTED CEILING PLAN - WEST
AE410	EXAM ROOM, CLEAN SUPPLY, STAFF LOUNGE, GROUP ROOM – ENLARGED FLOOR PLAN
AE411	WOMEN’S HEALTH & PROCEDURE ROOM – ENLARGED FLOOR PLAN & RCP
AE412	TYP PACT TEAM & RECEPTION – ENLARGED FLOOR PLANS & RCP
AE413	MSA, POLICE, ALCOVE HW, HOUSEKEEPING, LACTATION ALCOVE – ENLARGED FLOOR PLANS
AE414	TOILETS, SOILED MED EQUIP, & OFFICE – ENLARGED FLOOR PLANS

AE430	EXAM ROOM & WOMEN'S HEALTH & LACTATION ROOM – INTERIOR ELEVATIONS
AE431	PROCEDURE ROOM, CLEAN SUPPLY & SOILED MED EQUIP ROOM – INTERIOR ELEVATIONS
AE 432	TYP PACT TEAM & RECEPTION – INTERIOR ELEVATIONS
AE433	GROUP ROOM & STAFF LOUNGE – INTERIOR ELEVATIONS
AE434	MSA/BUS SERVICES & HOUSEKEEPING & STAFF TOILET – INTERIOR ELEVATIONS
AE435	FAMILY TLT, ALCOVE, AND ALCOVE, HW – INTERIOR ELEVATIONS
AE436	PUBLIC TLTS – INTERIOR ELEVATIONS
AE437	OFFICE, PATIENT TLT & POLICE OFFICE – INTERIOR ELEVATIONS
AE438	WMN'S HEALTH TLT INTERIOR ELEVATIONS, TYPICAL LOCKER RCP, ELEVATION & SECTION
AE438	LOCKER AND CASEWORK INTERIOR ELEVATIONS
AE450	COFFEE AREA – ADD ALT 1
AE451	SOLAR PANELS – ADD ALT 2
AE452	PACT (WEST) – ADD ALT 3
AE453	PACT (WEST) – SCHEDULES - ADD ALT 3
AE456	PACT (EAST) – ADD ALT 4
AE457	PACT (EAST) – SCHEDULES AND SIGNAGE – ADD ALT 4
AE458	WALL PROTECTIONS – ADD ALT 5
AE491	WALL SECTIONS
AE492	WALL SECTIONS
A-501	DOOR DETAILS
A-502	WINDOW DETAILS
A-503	EXTERIOR DETAILS – ENLARGED PLANS AND DETAILS
A-504	EXTERIOR DETAILS
A-505	EXTERIOR DETAILS
A-506	EXTERIOR DETAILS
A-507	EXTERIOR DETAILS

A-508	SITE DETAILS
A-509	INTERIOR DETAILS
A-510	INTERIOR DETAILS
A-511	INTERIOR DETAILS
A-512	INTERIOR DETAILS
AW001	SIGNAGE MESSAGE SCHEDULE
AW002	IN-01.02, IN-01.26
AW003	IN-02.01, IN-02.02, IN-02.03
AW004	IN-02.04, IN-02.07, IN-02.08
AW005	IN-02.10, IN-04.02, IN-07.02
AW006	IN-08.02, IN-09.03, IN-09.08, IN-15.52
AW007	IN-99.01-01
AW008	IN-99.02-01
AW009	PL-12.01, PL-12.04
AW010	PL-12.05, EN-03.05
AW015	VA SEAL PLAQUES
A-601	DOOR, EQUIPMENT, & WINDOW & LOUVER SCHEDULES
A-602	STOREFRONT ELEVATIONS
A-611	WALL, FLOOR, CEILING & ROOF TYPES
A-612	WALL TYPES
IN100	INTERIOR FINISH PLAN
IN102	INTERIOR FINISH LEGEND, FINISH DETAILS & ROOM FINISH SCHEDULE
IN103	INTERIOR FINISH ELEVATIONS
IN104	COFFEE AREA – ADD ALT 1
IN105	PACT (WEST) – ADD ALT 3
IN106	PACT (EAST) – ADD ALT 4
IWP01	INTERIOR WALL PROTECTION PLAN & DETAILS
IWP02	WALL PROTECTION – ADD ALT 5

MECHANICAL

M-001	LEGENDS, SYMBOLS, ABBREVIATIONS, & NOTES - MECHANICAL
MH101	FLOOR PLAN - HVAC
MH102	PENTHOUSE MECHANICAL ROOM PLAN - HVAC
MH103	ROOF PLAN - HVAC
MP104	FLOOR PLAN - MECH PIPING
MP105	PENTHOUSE MECHANICAL ROOM PLAN - MECHANICAL PIPING
MP106	ROOF PLAN – MECHANICAL PIPING
M-107	AIR FLOW & PRESSURE DIAGRAM
MP401	ENLARGED MECHANICAL ROOM & RISER – MECH PIPING
MH402	ENLARGED FLOOR PLAN – PACT (WEST) – ADD ALT 3 - HVAC
MH403	ENLARGED FLOOR PLAN – PACT (EAST) – ADD ALT 4 - HVAC
M-501	MECHANICAL DETAILS
M-502	MECHANICAL DETAILS
MI503	TEMPERATURE CONTROL DIAGRAMS
MI504	TEMPERATURE CONTROL DIAGRAMS
MI505	TEMPERATURE CONTROL DIAGRAMS
M-601	SCHEDULES – MECHANICAL
M-602	SCHEDULES – MECHANICAL
P-001	NOTES, LEGENDS, & SCHEDULES - PLUMBING
PW101	FOUNDATION PLAN - PLUMBING
PL102	FLOOR PLAN – PLUMBING
PL103	MECHANICAL ROOM PLAN – PLUMBING
P-104	ROOF PLAN – PLUMBING
PF105	FIRE PROTECTION – AUTOMATIC SPRINKLERS SYSTEM – FLOOR PLAN
PF106	FIRE PROTECTION – AUTOMATIC SPRINKLERS SYSTEM PENTHOUSE PLAN
PL401	ENLARGED FLOOR PLAN – EAST – PLUMBING
PL402	ENLARGED FLOOR PLAN – CENTER – PLUMBING

PL403	ENLARGED FLOOR PLAN – WEST – PLUMBING
PL404	COFFEE AREA – ADD ALT 1 – PLUMBING
PL405	ENLARGED FLOOR PLAN – PACT (WEST) – ADD ALT 3 - PLUMBING
PL406	ENLARGED FLOOR PLAN – PACT (EAST) – ADD ALT 4 - PLUMBING
P-501	DETAILS - PLUMBING

ELECTRICAL

E-001	GENERAL NOTES, ABBREVIATIONS AND LEGENDS
ES100	OVERALL – ELECTRICAL SITE PLAN
ES101	ENLARGED SITE – ELECTRICAL PLAN
EL101	LEVEL 1 – LIGHTING PLAN – EAST
EL101A	LEVEL 1 – LIGHTING PLAN – EAST (ADD ALT #3, #4)
EL102	LEVEL 1 – LIGHTING PLAN – CENTER
EL102A	LEVEL 1 – LIGHTING PLAN – CENTER (ADD ALT #3)
EL103	LEVEL 1 – LIGHTING PLAN – WEST
EL103A	LEVEL 1 – LIGHTING PLAN – WEST (ADD ALT #1)
EL104	ROOF AND MECHANICAL PENTHOUSE – LIGHTING PLANS
EP101	LEVEL 1 – POWER PLAN – EAST
EP101A	LEVEL 1 – POWER PLAN – EAST (ADD ALT #3, #4)
EP102	LEVEL 1 – POWER PLAN – CENTER
EP102A	LEVEL 1 – POWER PLAN – CENTER (ADD ALT #3)
EP103	LEVEL 1 – POWER PLAN – WEST
EP103A	LEVEL 1 – POWER PLAN – WEST (ADD ALT #1)
EP104	ROOF AND MECHANICAL PENTHOUSE – POWER PLANS
EP104A	ROOF AND MECHANICAL PENTHOUSE – POWER PLANS (ADD ALT #2)
ET101	LEVEL 1 – SPECIAL SYSTEMS PLAN – EAST
ET101A	LEVEL 1 – SPECIAL SYSTEMS PLAN – EAST (ADD ALT #3, #4)
ET102	LEVEL 1 – SPECIAL SYSTEMS PLAN – CENTER

ET102A	LEVEL 1 – SPECIAL SYSTEMS PLAN – CENTER (ADD ALT #3)
ET103	LEVEL 1 – SPECIAL SYSTEMS PLAN – WEST
ET103A	LEVEL 1 – SPECIAL SYSTEMS PLAN – WEST (ADD ALT #1)
ET104	ROOF AND MECHANICAL PENTHOUSE – SPECIAL SYSTEMS PLANS
ET104A	ROOF AND MECHANICAL PENTHOUSE – SPECIAL SYSTEMS PLANS (ADD ALT #2)
EG101	LEVEL 1 – OVERALL GROUNDING PLAN
EG101A	LEVEL 1 – OVERALL GROUNDING PLAN (ADD ALT #2)
E-201	EXTERIOR ELEVATIONS
E-202	EXTERIOR ELEVATIONS
E-401	ENLARGED PLANS
E-401A	ENLARGED PLANS (ADD ALT #2)
E-501	ELECTRICAL DETAILS
E-502	ELECTRICAL DETAILS
E-503	ELECTRICAL DETAILS
E-504	ELECTRICAL DETAILS
E-505	ELECTRICAL DETAILS
E-506	ELECTRICAL DETAILS
E-601	ONE-LINE DIAGRAM AND ELECTRICAL LOAD SCHEDULES
E-601A	ONE-LINE DIAGRAM AND ELECTRICAL LOAD SCHEDULES (ADD ALT #2)
E-602	ELECTRICAL SCHEDULES
E-603	ELECTRICAL SCHEDULES
E-604	ELECTRICAL SCHEDULES
EY001	ADDITIVE ALTERNATE 2 ELECTRICAL LEGEND
EY104	ADDITIVE ALTERNATE 2 ROOF PLAN - ELECTRICAL
EY501	ADDITIVE ALTERNATE 2 SOLAR DETAILS
EY601	ADDITIVE ALTERNATE 2 PV ONE-LINE DIAGRAM
- - - END - - -	

SECTION 01 00 00
GENERAL REQUIREMENTS

TABLE OF CONTENTS

1.1 SAFETY REQUIREMENTS.....	3
1.2 GENERAL INTENTION	3
1.3 STATEMENT OF BID ITEM(S)	4
1.4 SPECIFICATIONS AND DRAWINGS FOR CONTRACTOR.....	7
1.5 CONSTRUCTION SECURITY REQUIREMENTS.....	7
1.6 OPERATIONS AND STORAGE AREAS	10
1.7 ALTERATIONS	15
1.8 DISPOSAL AND RETENTION	16
1.9 PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS	17
1.10 RESTORATION	18
1.11 PHYSICAL DATA	19
1.12 PROFESSIONAL SURVEYING SERVICES	19
1.13 LAYOUT OF WORK.....	20
1.14 AS-BUILT DRAWINGS	23
1.15 WARRANTY MANAGEMENT.....	23
1.16 USE OF ROADWAYS.....	30
1.17 RESIDENT ENGINEER'S FIELD OFFICE (nOT USED).....	31
1.18 TEMPORARY USE OF MECHANICAL AND ELECTRICAL EQUIPMENT	31
1.19 TEMPORARY USE OF EXISTING ELEVATORS (NOT USED).....	32
1.20 TEMPORARY USE OF NEW ELEVATORS (NOT USED).....	32
1.21 TEMPORARY TOILETS.....	32
1.22 AVAILABILITY AND USE OF UTILITY SERVICES.....	32
1.23 NEW TELEPHONE EQUIPMENT	33
1.24 TESTS	33
1.25 INSTRUCTIONS	35

1.26 GOVERNMENT-FURNISHED PROPERTY.....	36
1.27 RELOCATED EQUIPMENT	37
1.28 STORAGE SPACE FOR DEPARTMENT OF VETERANS AFFAIRS EQUIPMENT	38
1.29 CONSTRUCTION SIGN.....	39
1.30 SAFETY SIGN	39
1.31 PHOTOGRAPHIC DOCUMENTATION (NOT USED)	40
1.33 HISTORIC PRESERVATION.....	40
1.34 TOUR OF DUTY	40
1.35 LOCKOUT/TAGOUT POLICY	40
1.36 COMPLIANCE WITH CODES AND REGULATIONS.....	41
1.37 MATERIAL SAFETY AND HEALTH CONSIDERATIONS	41
1.38 UNKNOWN ASBESTOS.....	42
1.39 INSPECTIONS.....	42
1.40 MODIFICATIONS DUE TO EQUIPMENT CHANGES.....	42
1.41 MINIMUM CLEANLINESS FOR TURNOVER OF AREA	43
1.42 SCHEDULE	44
1.42.1 RESPONSIBILITY FOR COMPLETION	45
1.42.2 CHANGES TO THE SCHEDULE	46
1.42.3 ADJUSTMENT OF CONTRACT COMPLETION	47

SECTION 01 00 00
GENERAL REQUIREMENTS

1.1 SAFETY REQUIREMENTS

Refer to section 01 35 26, SAFETY REQUIREMENTS for safety and infection control requirements.

1.2 GENERAL INTENTION

- A. Contractor shall completely prepare site for building operations, including demolition and removal of existing structures, and furnish labor and materials and perform work for the construction of a new 22,000 square foot building on the Boise VA Medical Center Campus. The new building shall provide additional primary care and mental health care outpatient services on the BVAMC campus. The new building will be located at the corner of the parade grounds adjacent to Building T111 and across the street from Building 8. All work should be performed as required by drawings and specifications.
- B. Visits to the site by Bidders may be made only by appointment with the Medical Center Engineering Officer.
- C. Offices of Spees Design Build, as Architect-Engineers, will render certain technical services during construction. Such services shall be considered as advisory to the Government and shall not be construed as expressing or implying a contractual act of the Government without affirmations by Contracting Officer or his duly authorized representative.
- E. All employees of general contractor and subcontractors shall comply with VA security management program and obtain permission of the VA police, be identified by project and employer, and restricted from
- F. Schedule: See section 1.42 within this specification 01 00 00.

G. Prior to commencing work, general contractor shall provide proof that an OSHA certified “competent person” (CP) (29 CFR 1926.20(b)(2)) will maintain a presence at the work site whenever the general or subcontractors are present.

H. Training:

1. All employees of general contractor or subcontractors shall have the 10-hour OSHA certified Construction Safety course and /or other relevant competency training, as determined by the VA Contracting Officer with input from the Infection Control Risk Assessment (ICRA) team.
2. Submit training records of all such employees for approval before the start of work.

I. Terms used in this contract such as Veterans Affairs (VA) and Government; Contracting Officer (CO); Architect-Engineer (AE); Contracting Officer’s Technical Representative (COTR) or resident engineer (RE), Engineering Officer (EO) may be used interchangeably, and refer to the same entity.

1.3 STATEMENT OF BID ITEM(S)

A. ITEM I, GENERAL CONSTRUCTION: Work includes general construction, alterations, roads, walks, grading, drainage, and construction and certain other items.

ITEM II, Electrical Work: Work includes all labor, material, equipment and supervision to perform the required electrical construction work on this project depicted in the contract documents.

ITEM III, Mechanical Work: Work includes all labor, material, equipment and supervision to perform the required Mechanical construction work on this project depicted in the contract documents.

B. Add Alternate Number One: Coffee Area

Boise Veteran’s Administration (VA) staff may elect to construct a new now shop that is approximately 200 square feet. The coffee shop is designed to meet the VA’s standards. A

functional program was developed and will need to be verified by the VA at the time of construction. The coffee area will be enclosed by a wrapped countertop with a single point of entrance and exit accessed by a half door that swings 90 degrees inward toward the coffee area. The specialty equipment will be VA furnished and installed. The countertop will be a non-porous, homogeneous solid surface (S1). The cabinets and draws will be a high-pressure plastic laminate (PLAM1) The coffee area will feature an accent tile wall of Woven Slat AT64 constructed with 1"x3" stacked mosaic. The cabinets and draws will have an accent tile of BV33 Smoke applied to surfaces. . There is an exterior, pedestrian access to the coffee area from an operable window for customer pick up.

The coffee shop will provide prepared coffees, lattes expresso, etc. as well as brewed coffee. Prepared sandwiches, fresh fruit and smoothies will be available. The coffee shop will be self-contained with regards to storage and cleaning if equipment and dishes.

C. Add Alternate Number Two: Solar Supported Electrical Power Production

The design utilizes monocrystalline silicone Photovoltaic (PV) modules that feature all-weather technology for low light and high temperature conditions. The solar PV array mounting will use a combination of a ballasted (non-penetrating) aluminum racking system on the flat roof, a penetrating aluminum rail mounting system on the pitched roof, and an awning system on the wall. Each module will have a power optimizer to maximize the power production of individual models. The DC electricity generated by the PV modules and power optimizers will be converted to AC electricity by grid-interactive transformerless inverters that output 3-phase power for interconnection with the building electrical service.

The power output of the inverters will be connected to an AC panelboard designated as 'PV1'. This panelboard will be dedicated to the solar PV array to combine the outputs of the inverters into a single AC source for interconnection with the building electrical system. The PV source circuit will be routed through an enclosed circuit breaker designated as 'CB-PV' that will act as the disconnecting means for the PV system and as the rapid shutdown switch for first responders. From 'CB-PV', the PV source circuit will interconnect with the building electrical system at normal power electrical service switchboard designated as

'NMDP1' through a 100% back-fed circuit breaker. Circuit breaker 'CB-PV' will require an interlock with the emergency power system to ensure the solar PV system remains inactive when the building is on emergency power.

D. Add Alternate Number Three: Additional Clinic Space

Add Alternate three will be constructed in the PACT TEAM SHELL West and is mirrored from the Pact Team space to the East. The design is a "U" shaped floor plan that includes exam rooms, a procedure room, a women's health, and a clean supply room. Each exam room will consist of typical equipment (See Sheet AE452) and a majority will be furnished and installed by the VA and the remaining by the general contractor. Patients will utilize the exterior corridors to enter the exam rooms and the providers will utilize the centralized interior alcove. The centralized alcove utilizes acoustical canopies for noise reduction throughout the space and workstations for the providers to work seamlessly in and out of the exam rooms.

If Add Alternate three is the only add alternate selected there will be a wall constructed on the Northern border to cut off access to the rest of the PACT TEAM SHELL. As noted in the drawings, if Add Alternate four is selected, the wall in the northern border of Add Alternate four will not be constructed. Refer to the note located on AE452. "Do not construct this wall if Pact (East) – Add Alt 4 is selected"

E. Add Alternate Number Four: Additional Clinic Space

Add Alternate Four will be constructed in the PACT TEAM SHELL East and is a continuation of Add Alternate three. It is a mirrored condition of the Pact Team space to the North. The design is a "U" shaped floor plan that includes exam rooms surrounding the centralized PACT Team space. Each exam room will consist of typical equipment (See Sheet AE452) and a majority will be furnished and installed by the Veteran's Administration (VA) and the remaining equipment by the general contractor. Patients will utilize the exterior corridors to enter the exam rooms and the providers will utilize the centralized interior alcove. The

centralized alcove utilizes acoustical canopies for noise reduction throughout the space and workstations for the providers to work seamlessly in and out of the exam rooms.

If Add Alternate four is selected there will not be a wall constructed on the Northern border of Add Alternate three to limit access to the PACT TEAM SHELL. Add Alternate three must be construction preliminary to Add Alternate 4.

F. Add Alternate Number Five: Wall Protection

Add Alternate five will consist of applying rigid wall coverings 4'-0" from the ground onto the exam room walls of the base bid, and add alternate three (West) and four (East). The pattern/color for the rigid wall covering RWC1 is Balsa (69); Texture: P1 Dune, RWC2 is Boucle (LN); Texture P1 Dune, and RWC3 is Serene Gray (58); Texture: P1 Dune.

If add alternate five is selected, wall protection will apply to all exam rooms, women's health room and procedure room under the base bid. Add alternate three and four split a full PACT unit in half. If both three and four are constructed, the add alternate will also apply wall protection on the rest of the exam rooms, women's health room and the procedure room not under the base bid. If add alternate three is selected this add alternate five will only apply to the initial six exam rooms and the women's health and procedure room.

1.4 SPECIFICATIONS AND DRAWINGS FOR CONTRACTOR

- A. Drawings and contract documents may be obtained from the website where the solicitation is posted. Additional copies will be at Contractor's expense,.

1.5 CONSTRUCTION SECURITY REQUIREMENTS

- A. Security Plan:
 - 1. The security plan defines both physical and administrative security procedures that will remain effective for the entire duration of the project.
 - 2. The General Contractor is responsible for assuring that all sub-contractors working on the project and their employees also comply with these regulations.

B. Security Procedures:

1. General Contractor's employees shall not enter the project site without appropriate badge. They may also be subject to inspection of their personal effects when entering or leaving the project site.
2. Before starting work the General Contractor shall give one week's notice to the Contracting Officer so that security arrangements can be provided for the employees. This notice is separate from any notices required for utility shutdown described later in this section.
3. No photography of VA premises is allowed without written permission of the Contracting Officer.
4. VA reserves the right to close down or shut down the project site and order General Contractor's employees off the premises in the event of a national emergency. The General Contractor may return to the site only with the written approval of the Contracting Officer.

C. Key Control:

1. The General Contractor shall provide duplicate keys and lock combinations to the Contracting officers representative (COR) for the purpose of security inspections of every area of project including tool boxes and parked machines and take any emergency action.
2. The General Contractor shall turn over all permanent lock cylinders to the VA locksmith for permanent installation. See Section 08 71 00, DOOR HARDWARE and coordinate.

D. Document Control:

1. Before starting any work, the General Contractor/Sub Contractors shall submit an electronic security memorandum describing the approach to following goals and maintaining confidentiality of "sensitive information".

2. The General Contractor is responsible for safekeeping of all drawings, project manual and other project information. This information shall be shared only with those with a specific need to accomplish the project.
3. Certain documents, sketches, videos or photographs and drawings may be marked "Law Enforcement Sensitive" or "Sensitive Unclassified". Secure such information in separate containers and limit the access to only those who will need it for the project. Return the information to the Contracting Officer upon request.
4. These security documents shall not be removed or transmitted from the project site without the written approval of Contracting Officer.
5. All paper waste or electronic media such as CD's and diskettes shall be shredded and destroyed in a manner acceptable to the VA.
6. Notify Contracting Officer and Site Security Officer immediately when there is a loss or compromise of "sensitive information".
7. All electronic information shall be stored in specified location following VA standards and procedures using an Engineering Document Management Software (EDMS).
 - a. Security, access and maintenance of all project drawings, both scanned and electronic shall be performed and tracked through the EDMS system.
 - b. "Sensitive information" including drawings and other documents may be attached to e-mail provided all VA encryption procedures are followed.

E. Motor Vehicle Restrictions

1. Vehicle authorization request shall be required for any vehicle entering the site and such request shall be submitted 24 hours before the date and time of access. Access shall be restricted to picking up and dropping off materials and supplies.
2. A limited number of (2 to 5) permits shall be issued for General Contractor and its employees for parking in designated areas only.

F. Personal Conduct:

1. Every person who enters the Medical Center's grounds is expected to conduct themselves in a professional responsible manner without the need to enumerate every expected or prohibited behavior.
2. Weapons, ammunition, explosives, and alcoholic beverages are prohibited on the Medical Center's grounds.
3. There shall be no solicitations or sales of any kind on the Medical Center's grounds.
4. The Government reserves the right to refuse to permit employment on the Work or require dismissal from the Work of any subcontractor who, by reason of previous unsatisfactory work on Department of Veterans Affairs project or for any other reason, is considered by the Contracting Officer to be incompetent or otherwise objectionable.

(Reference VAAR 852.236-80)

1.6 OPERATIONS AND STORAGE AREAS

- A. The Contractor shall confine all operations (including storage of materials) on Government premises to areas authorized or approved by the Contracting Officer. The Contractor shall hold and save the Government, its officers and agents, free and harmless from liability of any nature occasioned by the Contractor's performance.
- B. Temporary buildings (e.g., storage sheds, shops, offices) and utilities may be erected by the Contractor only with the approval of the Contracting Officer and shall be built with labor and materials furnished by the Contractor without expense to the Government. The temporary buildings and utilities shall remain the property of the Contractor and shall be removed by the Contractor at its expense upon completion of the work. With the written consent of the Contracting Officer, the buildings and utilities may be abandoned and need not be removed.
- C. The Contractor shall, under regulations prescribed by the Contracting Officer, use only established roadways, or use temporary roadways constructed by the Contractor when and as authorized by the Contracting Officer. When materials are transported in prosecuting the work, vehicles shall not be loaded beyond the loading capacity

recommended by the manufacturer of the vehicle or prescribed by any Federal, State, or local law or regulation. When it is necessary to cross curbs or sidewalks, the Contractor shall protect them from damage. The Contractor shall repair or pay for the repair of any damaged curbs, sidewalks, or roads.

(FAR 52.236-10)

- D. Working space and space available for storing materials shall be as shown on the drawings.
- E. Workers are subject to rules of Medical Center applicable to their conduct.
- F. Execute work so as to interfere as little as possible with normal functioning of Medical Center as a whole, including operations of utility services, fire protection systems and any existing equipment, and with work being done by others. Use of equipment and tools that transmit vibrations and noises through the building structure, are not permitted in buildings that are occupied, during construction, jointly by patients or medical personnel, and Contractor's personnel, except as permitted by COR where required by limited working space.
 - 1. Do not store materials and equipment in other than assigned areas.
 - 2. Schedule delivery of materials and equipment to immediate construction working areas within buildings in use by Department of Veterans Affairs in quantities sufficient for not more than two work days. Medical Center areas required to remain in operation.
 - 3. Where access by Medical Center personnel to vacated portions of buildings is not required, storage of Contractor's materials and equipment will be permitted subject to fire and safety requirements.

G. Phasing:

The Medical Center must maintain its operation 24 hours a day 7 days a week.

Therefore, any interruption in service must be scheduled and coordinated with the COR

to ensure that no lapses in operation occur. It is the CONTRACTOR'S responsibility to develop a work plan and schedule detailing, at a minimum, the procedures to be employed, the equipment and materials to be used, the interim life safety measure to be used during the work, and a schedule defining the duration of the work with milestone subtasks. The work to be outlined shall include, but not be limited to:

To ensure such executions, Contractor shall furnish the COR with a schedule of approximate dates on which the Contractor intends to accomplish work in each specific area of site, building or portion thereof. In addition, Contractor shall notify the COR two weeks in advance of the proposed date of starting work in each specific area of site, building or portion thereof

1. Contractor shall take all measures and provide all material necessary for protecting existing equipment and property in affected areas of construction against dust and debris, so that equipment and affected areas to be used in the Medical Centers operations will not be hindered. Contractor shall permit access to Department of Veterans Affairs personnel and patients through other construction areas which serve as routes of access to such affected areas and equipment. These routes whether access or egress shall be isolated from the construction area by temporary partitions and have walking surfaces, lighting etc to facilitate patient and staff access. Coordinate alteration work in areas occupied by Department of Veterans Affairs so that Medical Center operations will continue during the construction period.
 2. Immediate areas of alterations not mentioned in preceding Subparagraph 1 will be temporarily vacated while alterations are performed.
- I. Construction Fence: Before construction operations begin, Contractor shall provide a chain link construction fence, seven feet minimum height, around the construction area indicated on the drawings. Provide gates as required for access with necessary hardware, including hasps and padlocks. Fasten fence fabric to terminal posts with tension bands and to line posts and top and bottom rails with tie wires spaced at

maximum 15 inches. Bottom of fences shall extend to one inch above grade. Remove the fence when directed by COR.

- J. When the construction site is turned over to Contractor, Contractor shall accept entire responsibility including upkeep and maintenance therefore:
1. Contractor shall maintain a minimum temperature of 4 degrees C (40 degrees F) at all times, except as otherwise specified.
 2. Contractor shall maintain in operating condition existing fire protection and alarm equipment. In connection with fire alarm equipment, Contractor shall make arrangements for pre-inspection of site with Fire Department or Company (Department of Veterans Affairs or municipal) whichever will be required to respond to an alarm from Contractor's employee or watchman.
- K. Utilities Services: Maintain existing utility services for Medical Center at all times. Provide temporary facilities, labor, materials, equipment, connections, and utilities to assure uninterrupted services. Where necessary to cut existing water, steam, gases, sewer or air pipes, or conduits, wires, cables, etc. of utility services or of fire protection systems and communications systems (including telephone), they shall be cut and capped at suitable places where shown; or, in absence of such indication, where directed by COR.
1. No utility service such as water, gas, steam, sewers or electricity, or fire protection systems and communications systems may be interrupted without prior approval of COR. Electrical work shall be accomplished with all affected circuits or equipment de-energized. When an electrical outage cannot be accomplished, work on any energized circuits or equipment shall not commence without a detailed work plan, the Medical Center Director's prior knowledge and written approval. Refer to specification Sections 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS, 27 05 11 REQUIREMENTS FOR COMMUNICATIONS INSTALLATIONS and 28 05 00,

COMMON WORK RESULTS FOR ELECTRONIC SAFETY AND SECURITY for additional requirements.

2. Contractor shall submit a request to interrupt any such services to Resident Engineer COR , in writing, 7 days n advance of proposed interruption. Request shall state reason, date, exact time of, and approximate duration of such interruption.
 3. Contractor will be advised (in writing) of approval of request, or of which other date and/or time such interruption will cause least inconvenience to operations of Medical Center. Interruption time approved by Medical Center may occur at other than Contractor's normal working hours.
 4. Major interruptions of any system must be requested, in writing, at least 15 calendar days prior to the desired time and shall be performed as directed by the COR.
 5. In case of a contract construction emergency, service will be interrupted on approval of COR. Such approval will be confirmed in writing as soon as practical.
 6. Whenever it is required that a connection fee be paid to a public utility provider for new permanent service to the construction project, for such items as water, sewer, electricity, gas or steam, payment of such fee shall be the responsibility of the Government and not the Contractor.
- L. Abandoned Lines: All services to be abandoned such as wires, cables, raceways, ducts, pipes, and the like and their hangers or supports, are to be removed entirely back to the point of connection to the active utility (i.e. piping and ductwork back to active mains, electrical wires and cables back to active circuitry, and all empty raceways). If items are noted to be abandoned in place, they are to be sealed, capped, or plugged.
- M. To minimize interference of construction activities with flow of Medical Center traffic, comply with the following:
1. Keep roads, walks and entrances to grounds, to parking and to occupied areas of buildings clear of construction materials, debris and standing construction

equipment and vehicles. Wherever excavation for new utility lines cross existing roads, at least one lane must be open to traffic at all times with approval.

2. Method and scheduling of required cutting, altering and removal of existing roads, walks and entrances must be approved by the COR.
- N. Coordinate the work for this contract with other construction operations as directed by COR. This includes the scheduling of traffic and the use of roadways, as specified in Article, USE OF ROADWAYS.

Reference Far 52.236-10 in General Conditions

1.7 ALTERATIONS

- A. Survey: Before any work is started, the Contractor shall make a thorough survey with the COR and a representative of VA Supply Service, of areas in which alterations occur and areas which are anticipated routes of access, and furnish a report, signed by both, to the Contracting Officer. This report shall list by spaces:
1. Shall note any discrepancies between drawings and existing conditions at site.
 2. Shall designate areas for working space, materials storage and routes of access to areas within buildings where alterations occur and which have been agreed upon by Contractor and COR.
- B. Any items required by drawings to be either reused or relocated or both, found during this survey to be nonexistent, or in opinion of Resident Engineer COR, to be in such condition that their use is impossible or impractical, shall be furnished and/or replaced by Contractor with new items in accordance with specifications which will be furnished by Government. Provided the contract work is changed by reason of this subparagraph B, the contract will be modified accordingly, under provisions of clause entitled "DIFFERING SITE CONDITIONS" (FAR 52.236-2) and "CHANGES" (FAR 52.243-4).
- C. Re-Survey: Thirty days before expected partial or final inspection date, the Contractor and COR together shall make a thorough re-survey of the areas of buildings involved.

They shall furnish a report on conditions then existing with conditions of same as noted in first condition survey report:

1. Re-survey report shall also list any damage caused by Contractor to such flooring and other surfaces, despite protection measures; and, will form basis for determining extent of repair work required of Contractor to restore damage caused by Contractor's workers in executing work of this contract.

D. Protection: Provide the following protective measures:

1. Wherever existing roof surfaces are disturbed they shall be protected against water infiltration. In case of leaks, they shall be repaired immediately upon discovery.
2. Temporary protection against damage for portions of existing structures and grounds where work is to be done, materials handled and equipment moved and/or relocated.
3. Protection of interior of existing structures at all times, from damage, dust and weather inclemency. Wherever work is performed, floor surfaces that are to remain in place shall be adequately protected prior to starting work, and this protection shall be maintained intact until all work in the area is completed.

1.8 DISPOSAL AND RETENTION

- A. Materials and equipment accruing from work removed and from demolition of buildings or structures, or parts thereof, shall be disposed of as follows:
 1. Reserved items which are to remain property of the Government are identified by attached tags or noted on drawings or in specifications as items to be stored. Items that remain property of the Government shall be removed or dislodged from present locations in such a manner as to prevent damage which would be detrimental to re-installation and reuse. Store such items where directed by COR.

2. Items not reserved shall become property of the Contractor and be removed by Contractor from Medical Center.
3. Items of portable equipment and furnishings located in rooms and spaces in which work is to be done under this contract shall remain the property of the Government. When rooms and spaces are vacated by the Department of Veterans Affairs during the alteration period, such items which are NOT required by drawings and specifications to be either relocated or reused will be removed by the Government in advance of work to avoid interfering with Contractor's operation.

1.9 PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS

- A. The Contractor shall preserve and protect all structures, equipment, and vegetation (such as trees, shrubs, and grass) on or adjacent to the work site, which are not to be removed and which do not unreasonably interfere with the work required under this contract. The Contractor shall only remove trees when specifically authorized to do so, and shall avoid damaging vegetation that will remain in place. If any limbs or branches of trees are broken during contract performance, or by the careless operation of equipment, or by workers, the Contractor shall trim those limbs or branches with a clean cut and paint the cut with a tree-pruning compound as directed by the Contracting Officer.
- B. The Contractor shall protect from damage all existing improvements and utilities at or near the work site and on adjacent property of a third party, the locations of which are made known to or should be known by the Contractor. The Contractor shall repair any damage to those facilities, including those that are the property of a third party, resulting from failure to comply with the requirements of this contract or failure to exercise reasonable care in performing the work. If the Contractor fails or refuses to repair the damage promptly, the Contracting Officer may have the necessary work performed and charge the cost to the Contractor.

(FAR 52.236-9)

- C. Refer to Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS, for additional requirements on protecting vegetation, soils and the environment. Refer to Articles, "Alterations", "Restoration", and "Operations and Storage Areas" for additional instructions concerning repair of damage to structures and site improvements.

Reference FAR 52.236-9 in General Conditions

1.10 RESTORATION

- A. Remove, cut, alter, replace, patch and repair existing work as necessary to install new work. Except as otherwise shown or specified, do not cut, alter or remove any structural work, and do not disturb any ducts, plumbing, steam, gas, or electric work without approval of the COR. Existing work to be altered or extended and that is found to be defective in any way, shall be reported to the COR before it is disturbed. Materials and workmanship used in restoring work, shall conform in type and quality to that of original existing construction, except as otherwise shown or specified.
- B. Upon completion of contract, deliver work complete and undamaged. Existing work (walls, ceilings, partitions, floors, mechanical and electrical work, lawns, paving, roads, walks, etc.) disturbed or removed as a result of performing required new work, shall be patched, repaired, reinstalled, or replaced with new work, and refinished and left in as good condition as existed before commencing work.
- C. At Contractor's own expense, Contractor shall immediately restore to service and repair any damage caused by Contractor's workers to existing piping and conduits, wires, cables, etc., of utility services or of fire protection systems and communications systems (including telephone) which are not scheduled for discontinuance or abandonment.
- D. Expense of repairs to such utilities and systems not shown on drawings or locations of which are unknown will be covered by adjustment to contract time and price in accordance with clause entitled "CHANGES" (FAR 52.243-4) and "DIFFERING SITE CONDITIONS" (FAR 52.236-2).

1.11 PHYSICAL DATA

- A. Data and information furnished or referred to below is for the Contractor's information. The Government shall not be responsible for any interpretation of or conclusion drawn from the data or information by the Contractor.

1. The indications of physical conditions on the drawings and in the specifications are the result of site investigations

(FAR 52.236-4)

- B. Subsurface conditions have been developed by core borings and test pits. Logs of subsurface exploration are shown diagrammatically on drawings.
- C. A copy of the soil report will be made available for inspection by bidders upon request to the Engineering Officer at the VA Medical Center, and shall be considered part of the contract documents.
- D. Government does not guarantee that other materials will not be encountered nor that proportions, conditions or character of several materials will not vary from those indicated by explorations. Bidders are expected to examine site of work and logs of borings; and, after investigation, decide for themselves character of materials and make their bids accordingly. Upon proper application to Department of Veterans Affairs, bidders will be permitted to make subsurface explorations of their own at site.

1.12 PROFESSIONAL SURVEYING SERVICES

A registered professional land surveyor or registered civil engineer whose services are retained and paid for by the Contractor shall perform services specified herein and in other specification sections. The Contractor shall certify that the land surveyor or civil engineer is not one who is a regular employee of the Contractor, and that the land surveyor or civil engineer has no financial interest in this contract.

1.13 LAYOUT OF WORK

- A. The Contractor shall lay out the work from Government established base lines and bench marks, indicated on the drawings, and shall be responsible for all measurements in connection with the layout. The Contractor shall furnish, at Contractor's own expense, all stakes, templates, platforms, equipment, tools, materials, and labor required to lay out any part of the work. The Contractor shall be responsible for executing the work to the lines and grades that may be established or indicated by the Contracting Officer. The Contractor shall also be responsible for maintaining and preserving all stakes and other marks established by the Contracting Officer until authorized to remove them. If such marks are destroyed by the Contractor or through Contractor's negligence before their removal is authorized, the Contracting Officer may replace them and deduct the expense of the replacement from any amounts due or to become due to the Contractor.

(FAR 52.236-17)

- B. Establish and plainly mark center lines for each building and corner of column lines and/or addition to each existing building, such other lines and grades that are reasonably necessary to properly assure that location, orientation, and elevations established for each such structure and/or addition, roads, parking lots, are in accordance with lines and elevations shown on contract drawings.
- C. Following completion of general mass excavation and before any other permanent work is performed, establish and plainly mark (through use of appropriate batter boards or other means) sufficient additional survey control points or system of points as may be necessary to assure proper alignment, orientation, and grade of all major features of work. Survey shall include, but not be limited to, location of lines and grades of footings, exterior walls, center lines of columns in both directions, major utilities and elevations of floor slabs:
1. Such additional survey control points or system of points thus established shall be checked and certified by a registered land surveyor or registered civil engineer.

Furnish such certification to the COR before any work (such as footings, floor slabs, columns, walls, utilities and other major controlling features) is placed.

- D. During progress of work, and particularly as work progresses from floor to floor, Contractor shall have line grades and plumbness of all major form work checked and certified by a registered land surveyor or registered civil engineer as meeting requirements of contract drawings. Furnish such certification to the COR before any major items of concrete work are placed. In addition, Contractor shall furnish to the COR certificates from a registered land surveyor or registered civil engineer that the following work is complete in every respect as required by contract drawings.
1. Lines of each building and/or addition.
 2. Elevations of bottoms of footings and tops of floors of each building and/or addition.
 3. Lines and elevations of sewers and of all outside distribution systems.
 5. Lines of elevations of all swales and interment areas.
 6. Lines and elevations of roads, streets and parking lots.
- E. Whenever changes from contract drawings are made in line or grading requiring certificates, record such changes on a reproducible drawing bearing the registered land surveyor or registered civil engineer seal, and forward these drawings upon completion of work to Resident Engineer COR.
- F. The Contractor shall perform the surveying and layout work of this and other articles and specifications in accordance with the provisions of Article "Professional Surveying Services".
- G. The Contractor shall keep on the work site a copy of the Drawings and Specifications and shall at all times give the Contracting Officer and COTR access thereto. Anything mentioned in the Specification and not shown on the Drawings, or shown on the Drawings and not mentioned in the Specifications, shall be of like effect as if shown or

mentioned in both. In case of difference between Drawings and Specifications, the Contractor shall issue a Request for Information (RFI) requesting confirmation as to which shall govern. In case of discrepancy in the figures, in the Drawings, or in the Specifications, the matter shall be promptly submitted to the Contracting Officer, who shall promptly make a determination in writing. Any adjustment by the Contractor without such a determination shall be at the Contractor's own risk and expense. The Contracting Officer shall furnish from time to time such detailed drawings and other information as considered necessary unless otherwise provided.

- H. Wherever in the Specifications or upon the Drawings the words "directed", "required", "ordered", "designated", "prescribed", or words of like import are used, it shall be understood that the "direction", "requirement", "order", "designation", or "prescription" of the Contracting Officer is intended and similarly the words "approved", "acceptable", "satisfactory", or words of the like import shall mean "approved by", or "acceptable to", or "satisfactory to" the Contracting Officer, unless otherwise expressly stated.
- I. Where "as shown", "as indicated", "as detailed" or words of similar import are used, it shall be understood that the reference is made to the Drawings accompanying this Contract unless stated otherwise. The word "provided" as used herein shall be understood to mean "provide complete in place", that is "furnished and installed".
- J. Upon completing the work under this Contract, the Contractor shall furnish two complete sets of all shop drawings as finally approved. These drawings shall show all changes and revisions made up to the time the equipment is completed and accepted.
- K. The Contracting Officer's interpretation of the Drawings and Specification will be final, subject to the disputes clause.
- L. Large scale drawings supersede small scale drawings.
- M. Dimensions govern in all cases. Scaling of Drawings may be done only for general location and general size of items.

- N. Dimensions shown of existing work and all dimensions required for work that is to connect with existing work, shall be verified by the Contractor by actual measurement of the existing work. Any work at variance with that specified or shown in the Drawings shall not be performed by the Contractor until approved in writing by the Contracting Officer.

1.14 AS-BUILT DRAWINGS

- A. The contractor shall maintain two full size sets of as-built drawings which will be kept current during construction of the project, to include all contract changes, modifications and clarifications.
- B. All variations shall be shown in the same general detail as used in the contract drawings. To ensure compliance, as-built drawings shall be made available for the COR review, as often as requested.
- C. Contractor shall deliver two approved completed sets of as-built drawings in the electronic version (scanned PDF) to the COR within 15 calendar days after each completed phase and after the acceptance of the project by the COR.
- D. Paragraphs A, B, & C shall also apply to all shop drawings.
- E. Failure to keep as-built drawings up-to-date shall be cause for withholding payments.
- F. Contractor is to provide an updated sequence of operation in digital format indicating all changes made to the original sequence of operation

1.15 WARRANTY MANAGEMENT

- A. Warranty Management Plan: Develop a warranty management plan which contains information relevant to FAR 52.246-21 Warranty of Construction in at least 30 days before the planned pre-warranty conference, submit one set of the warranty management plan. Include within the warranty management plan all required actions and documents to assure that the Government receives all warranties to which it is entitled. The plan must be in narrative form and contain sufficient detail to render it suitable for use by future maintenance and repair personnel, whether tradesman, or of

engineering background, not necessarily familiar with this contract. The term "status" as indicated below must include due date and whether item has been submitted or was approved. Warranty information made available during the construction phase must be submitted to the Contracting Officer for approval prior to each monthly invoice for payment. Assemble approved information in a binder and turn over to the Government upon acceptance of the work. The construction warranty period will begin on the date of the project acceptance and continue for the product warranty period. A joint 4 month and 9 month warranty inspection will be conducted, measured from time of acceptance, by the Contactor and the Contracting Officer. Include in the warranty management plan, but not limited to, the following:

1. Roles and responsibilities of all personnel associated with the warranty process, including points of contact and telephone numbers within the company of the Contractor, subcontractors, manufacturers or suppliers involved.
2. Furnish with each warranty the name, address and telephone number of each of the guarantor's representatives nearest project location.
3. Listing and status of delivery of all Certificates of Warranty for extended warranty items, to include roofs, HVAC balancing, pumps, motors, transformers and for all commissioned systems such as fire protection and alarm systems, sprinkler systems and lightning protection systems, etc.
4. A list for each warranted equipment item, feature of construction or system indicating:
 - a. Name of item.
 - b. Model and serial numbers.
 - c. Location where installed.
 - d. Name and phone numbers of manufacturers and suppliers.
 - e. Name and phone numbers of manufacturers or suppliers.

- f. Names, addresses and phone numbers of sources of spare parts.
 - g. Warranties and terms of warranty. Include one-year overall warranty of construction, including the starting date of warranty of construction. Items which have extended warranties must be indicated with separate warranty expiration dates.
 - h. Starting point and duration of warranty period.
 - i. Summary of maintenance procedures required to continue the warranty in force.
 - j. Cross-reference to specific pertinent Operation and Maintenance manuals.
 - k. Organizations, names and phone numbers of persons to call for warranty service.
 - l. Typical response time and repair time expected for various warranted equipment.
- 5. The plans for attendance at the 4 and 9-month post construction warranty inspections conducted by the government.
 - 6. Procedure and status of tagging of all equipment covered by extended warranties.
 - 7. Copies of instructions to be posted near selected pieces of equipment where operation is critical for warranty and/or safety reasons.
- B. Performance Bond: The Performance Bond must remain effective throughout the construction period
- 1. In the event the Contractor fails to commence and diligently pursue any construction warranty work required, the Contracting Officer will have the work performed by others, and after completion of the work, will charge the remaining construction warranty funds of expenses incurred by the Government while performing the work, including, but not limited to administrative expenses.

2. In the event sufficient funds are not available to cover the construction warranty work performed by the Government at the contractor's expenses, the Contracting Officer will have the right to recoup expenses from the bonding company.
 3. Following oral or written notification of required construction warranty repair work, the Contractor shall respond in a timely manner. Written verification will follow oral instructions. Failure to respond will be cause for the Contracting Officer to proceed against the Contractor.
- C. Pre-Warranty Conference: Prior to contract completion, and at a time designated by the Contracting Officer, the Contractor shall meet with the Contracting Officer to develop a mutual understanding with respect to the requirements of this section. Communication procedures for Contractor notification of construction warranty defects, priorities with respect to the type of defect, reasonable time required for Contractor response, and other details deemed necessary by the Contracting Officer for the execution of the construction warranty will be established/ reviewed at this meeting. In connection with these requirements and at the time of the Contractor's quality control completion inspection, furnish the name, telephone number and address of a licensed and bonded company which is authorized to initiate and pursue construction warranty work action on behalf of the Contractor. This point of contact will be located within the local service area of the warranted construction, be continuously available and be responsive to Government inquiry on warranty work action and status. This requirement does not relieve the Contractor of any of its responsibilities in conjunction with other portions of this provision.
- D. Contractor's Response to Construction Warranty Service Requirements:
- Following oral or written notification by the Contracting Officer, the Contractor shall respond to construction warranty service requirements in accordance with the "Construction Warranty Service Priority List" and the three categories of priorities listed below. Submit a report on any warranty item that has been repaired during the warranty period. Include within the report the cause of the problem, date reported,

corrective action taken, and when the repair was completed. If the Contractor does not perform the construction warranty within the timeframe specified, the Government will perform the work and back charge the construction warranty payment item established.

1. First Priority Code 1. Perform onsite inspection to evaluate situation, and determine course of action within 4 hours, initiate work within 6 hours and work continuously to completion or relief.
2. Second Priority Code 2. Perform onsite inspection to evaluate situation, and determine course of action within 8 hours, initiate work within 24 hours and work continuously to completion or relief.
3. Third Priority Code 3. All other work to be initiated within 3 work days and work continuously to completion or relief.
4. The "Construction Warranty Service Priority List" is as follows:

Code 1-Life Safety Systems

- a. Fire suppression systems.
- b. Fire alarm system(s).

Code 1-Air Conditioning Systems

- a. Air conditioning leak in part of the building, if causing damage.
- b. Air conditioning system not cooling properly.

Code 1 Doors

- a. Overhead doors not operational, causing a security, fire or safety problem.
- b. Interior, exterior personnel doors or hardware, not functioning properly, causing security, fire or safety problem.

Code 3-Doors

- a. Overhead doors not operational.

- b. Interior/exterior personnel doors or hardware not functioning properly.

Code 1-Electrical

- a. Power failure (entire area or any building operational after 1600 hours).
- b. Security lights.
- c. Smoke detectors.

Code 2-Electrical

- a. Power failure (no power to a room or part of building).
- b. Receptacles and lights not operational (in a room or part of building).

Code 3-Electrical

- a. Exterior lights not operational.

Code 1-Gas

- a. Leaks and pipeline breaks.

Code 1-Heat

- a. Power failure affecting heat.

Code 1-Plumbing

- a. Hot water heater failure.
- b. Leaking water supply pipes.

Code 2-Plumbing

- a. Flush valves not operating properly
- b. Fixture drain, supply line or any water pipe leaking.
- c. Toilet leaking at base.

Code 3- Plumbing

- a. Leaky faucets.

Code 3-Interior

- a. Floors damaged.
- b. Paint chipping or peeling.
- c. Casework damaged.

Code 1-Roof Leaks

- a. Damage to property is occurring.

Code 2-Water (Exterior)

- a. No water to facility.

Code 2-Water (Hot)

- a. No hot water in portion of building listed.

Code 3

- a. All work not listed above.

- E. Warranty Tags: At the time of installation, tag each warranted item with a durable, oil and water-resistant tag approved by the Contracting Officer. Attach each tag with a copper wire and spray with a silicone waterproof coating. Also submit two record copies of the warranty tags showing the layout and design. The date of acceptance and the QC signature must remain blank until the project is accepted for beneficial occupancy. Show the following information on the tag.

Type of product/material	
Model number	
Serial number	
Contract number	
Warranty period from/to	
Inspector's signature	
Construction Contractor	
Address	
Telephone number	
Warranty contact	
Address	
Telephone number	
Warranty response time priority code	

1.16 USE OF ROADWAYS

- A. For hauling, use only established public roads and roads on Medical Center property and, when authorized by the COR, such temporary roads which are necessary in the performance of contract work. Temporary roads shall be constructed and restoration performed by the Contractor at Contractor's expense. When necessary to cross curbing, sidewalks, or similar construction, they must be protected by well-constructed bridges.
- B. When new permanent roads are to be a part of this contract, Contractor may construct them immediately for use to facilitate building operations. These roads may be used by all who have business thereon within zone of building operations.
- C. When certain buildings (or parts of certain buildings) are required to be completed in advance of general date of completion, all roads leading thereto must be completed and available for use at time set for completion of such buildings or parts thereof.

1.17 RESIDENT ENGINEER'S FIELD OFFICE (NOT USED)

1.18 TEMPORARY USE OF MECHANICAL AND ELECTRICAL EQUIPMENT

- A. Use of new installed mechanical and electrical equipment to provide heat, ventilation, plumbing, light and power will be permitted subject to written approval and compliance with the following provisions:
1. Permission to use each unit or system must be given by COR in writing. If the equipment is not installed and maintained in accordance with the written agreement and following provisions, the COR will withdraw permission for use of the equipment.
 2. Electrical installations used by the equipment shall be completed in accordance with the drawings and specifications to prevent damage to the equipment and the electrical systems, i.e. transformers, relays, circuit breakers, fuses, conductors, motor controllers and their overload elements shall be properly sized, coordinated and adjusted. Installation of temporary electrical equipment or devices shall be in accordance with NFPA 70, National Electrical Code, (2014 Edition), Article 590, *Temporary Installations*. Voltage supplied to each item of equipment shall be verified to be correct and it shall be determined that motors are not overloaded. The electrical equipment shall be thoroughly cleaned before using it and again immediately before final inspection including vacuum cleaning and wiping clean interior and exterior surfaces.
 3. Units shall be properly lubricated, balanced, and aligned. Vibrations must be eliminated.
 4. Automatic temperature control systems for preheat coils shall function properly and all safety controls shall function to prevent coil freeze-up damage.
 5. The air filtering system utilized shall be that which is designed for the system when complete, and all filter elements shall be replaced at completion of construction and prior to testing and balancing of system.

6. All components of heat production and distribution system, metering equipment, condensate returns, and other auxiliary facilities used in temporary service shall be cleaned prior to use; maintained to prevent corrosion internally and externally during use; and cleaned, maintained and inspected prior to acceptance by the Government. Boilers, pumps, feedwater heaters and auxiliary equipment must be operated as a complete system and be fully maintained by operating personnel. Boiler water must be given complete and continuous chemical treatment.
- B. Prior to final inspection, the equipment or parts used which show wear and tear beyond normal, shall be replaced with identical replacements, at no additional cost to the Government.
- C. This paragraph shall not reduce the requirements of the mechanical and electrical specifications sections.
- D. Any damage to the equipment or excessive wear due to prolonged use will be repaired replaced by the contractor at the contractor's expense.

1.19 TEMPORARY USE OF EXISTING ELEVATORS (NOT USED)

1.20 TEMPORARY USE OF NEW ELEVATORS (NOT USED)

1.21 TEMPORARY TOILETS

- A. Provide where directed, (for use of all Contractor's workers) ample temporary sanitary toilet accommodations with suitable sewer and water connections; or, when approved by COR , provide suitable dry closets where directed. Keep such places clean and free from flies, and all connections and appliances connected therewith are to be removed prior to completion of contract, and premises left perfectly clean.

1.22 AVAILABILITY AND USE OF UTILITY SERVICES

- A. Heat: Furnish temporary heat necessary to prevent injury to work and materials through dampness and cold. Use of open salamanders or any temporary heating devices which may be fire hazards or may smoke and damage finished work, will not be permitted. Maintain minimum temperatures as specified for various materials:

1. Obtain heat by connecting to Medical Center heating distribution system.
- B. Electricity (for Construction and Testing): Furnish all temporary electric services.
 1. Obtain electricity by connecting to the Medical Center electrical distribution system.

The Contractor shall meter and pay for electricity required for electric cranes and hoisting devices, electrical welding devices and any electrical heating devices providing temporary heat. Electricity for all other uses is available at no cost to the Contractor.
- C. Water (for Construction and Testing): Furnish temporary water service.
 1. Obtain water by connecting to the Medical Center water distribution system.

Provide reduced pressure backflow preventer at each connection as per code. Water is available at no cost to the Contractor.
 2. Maintain connections, pipe, fittings and fixtures and conserve water-use so none is wasted. Failure to stop leakage or other wastes will be cause for revocation (at COR discretion) of use of water from \ Medical Center's system.
- D. Fuel: Natural and LP gas and burner fuel oil required for boiler cleaning, normal initial boiler-burner setup and adjusting, and for performing the specified boiler tests will be furnished by the Government. Fuel required for prolonged boiler-burner setup, adjustments, or modifications due to improper design or operation of boiler, burner, or control devices shall be furnished and paid by the Contractor at Contractor's expense.

Reference Far 52.236-14 in General Conditions

1.23 NEW TELEPHONE EQUIPMENT

The contractor shall coordinate with the work of installation of telephone equipment by others. This work shall be completed before the building is turned over to VA.

1.24 TESTS

- A. As per specification section 23 05 93 the contractor shall provide a written testing and commissioning plan complete with component level, equipment level, sub-system level

and system level breakdowns. The plan will provide a schedule and a written sequence of what will be tested, how and what the expected outcome will be. This document will be submitted for approval prior to commencing work. The contractor shall document the results of the approved plan and submit for approval with the as built documentation.

- B. Pre-test mechanical and electrical equipment and systems and make corrections required for proper operation of such systems before requesting final tests. Final test will not be conducted unless pre-tested.
- C. Conduct final tests required in various sections of specifications in presence of an authorized representative of the Contracting Officer. Contractor shall furnish all labor, materials, equipment, instruments, and forms, to conduct and record such tests.
- D. Mechanical and electrical systems shall be balanced, controlled and coordinated. A system is defined as the entire system which must be coordinated to work together during normal operation to produce results for which the system is designed. For example, air conditioning supply air is only one part of entire system which provides comfort conditions for a building. Other related components are return air, exhaust air, steam, chilled water, refrigerant, hot water, controls and electricity, etc. Another example of a system which involves several components of different disciplines is a boiler installation. Efficient and acceptable boiler operation depends upon the coordination and proper operation of fuel, combustion air, controls, steam, feedwater, condensate and other related components.
- E. All related components as defined above shall be functioning when any system component is tested. Tests shall be completed within a reasonably period of time during which operating and environmental conditions remain reasonably constant and are typical of the design conditions.
- F. Individual test result of any component, where required, will only be accepted when submitted with the test results of related components and of the entire system.

1.25 INSTRUCTIONS

- A. Contractor shall furnish Maintenance and Operating manuals (hard copies and electronic) and verbal instructions when required by the various sections of the specifications and as hereinafter specified, but no later than 2 weeks prior to final inspection.
- B. Manuals: Maintenance and operating manuals and one compact disc (four hard copies and one electronic copy each) for each separate piece of equipment shall be delivered to the COR coincidental with the delivery of the equipment to the job site. Manuals shall be complete, detailed guides for the maintenance and operation of equipment. They shall include complete information necessary for starting, adjusting, maintaining in continuous operation for long periods of time and dismantling and reassembling of the complete units and sub-assembly components. Manuals shall include an index covering all component parts clearly cross-referenced to diagrams and illustrations. Illustrations shall include "exploded" views showing and identifying each separate item. Emphasis shall be placed on the use of special tools and instruments. The function of each piece of equipment, component, accessory and control shall be clearly and thoroughly explained. All necessary precautions for the operation of the equipment and the reason for each precaution shall be clearly set forth. Manuals must reference the exact model, style and size of the piece of equipment and system being furnished. Manuals referencing equipment similar to but of a different model, style, and size than that furnished will not be accepted.
- C. Instructions: Contractor shall provide qualified, factory-trained manufacturers' representatives to give detailed training to assigned Department of Veterans Affairs personnel in the operation and complete maintenance for each piece of equipment. All such training will be at the job site. These requirements are more specifically detailed in the various technical sections. Instructions for different items of equipment that are component parts of a complete system, shall be given in an integrated, progressive manner. All instructors for every piece of component equipment in a system shall be available until instructions for all items included in the system have been completed. This is to assure proper instruction in the operation of inter-related systems. All

instruction periods shall be at such times as scheduled by the COR and shall be considered concluded only when the COR is satisfied in regard to complete and thorough coverage. The contractor shall submit a course outline with associated material to the COR for review and approval prior to scheduling training to ensure the subject matter covers the expectations of the VA and the contractual requirements. The Department of Veterans Affairs reserves the right to request the removal of, and substitution for, any instructor who, in the opinion of the COR, does not demonstrate sufficient qualifications in accordance with requirements for instructors above

1.26 GOVERNMENT-FURNISHED PROPERTY

- A. The Government shall deliver to the Contractor, the Government-furnished property shown on the drawings .
- B. Equipment furnished by Government to be installed by Contractor will be furnished to Contractor at the Medical Center
- C. Storage space for equipment will be provided by the Government and the Contractor shall be prepared to unload and store such equipment therein upon its receipt at the Medical Center
- D. Notify Contracting Officer in writing, 60 days in advance, of date on which Contractor will be prepared to receive equipment furnished by Government. Arrangements will then be made by the Government for delivery of equipment.
 - 1. Immediately upon delivery of equipment, Contractor shall arrange for a joint inspection thereof with a representative of the Government. At such time the Contractor shall acknowledge receipt of equipment described, make notations, and immediately furnish the Government representative with a written statement as to its condition or shortages.
 - 2. Contractor thereafter is responsible for such equipment until such time as acceptance of contract work is made by the Government.

- E. Equipment furnished by the Government will be delivered in a partially assembled (knock down) condition in accordance with existing standard commercial practices, complete with all fittings, fastenings, and appliances necessary for connections to respective services installed under contract. All fittings and appliances (i.e., couplings, elbows, tees, nipples, piping, conduits, cables, and the like) necessary to make the connection between the Government furnished equipment item and the utility stub-up shall be furnished and installed by the contractor at no additional cost to the Government.
- F. Completely assemble and install the Government furnished equipment in place ready for proper operation in accordance with specifications and drawings.
- G. Furnish supervision of installation of equipment at construction site by qualified factory trained technicians regularly employed by the equipment manufacturer.

1.27 RELOCATED EQUIPMENT

- A. Contractor shall disconnect, dismantle as necessary, remove and reinstall in new location, all existing equipment indicated by symbol "R" or otherwise shown to be relocated by the Contractor.
- B. Perform relocation of such equipment or items at such times and in such a manner as directed by the COR.
- C. Suitably cap existing service lines, such as steam, condensate return, water, drain, gas, air, vacuum and/or electrical, at the main whenever such lines are disconnected from equipment to be relocated. Remove abandoned lines in finished areas and cap as specified herein before under paragraph "Abandoned Lines".
- D. Provide all mechanical and electrical service connections, fittings, fastenings and any other materials necessary for assembly and installation of relocated equipment; and leave such equipment in proper operating condition.
- E. Contractor shall employ services of an installation engineer, who is an authorized representative of the manufacturer of this equipment to supervise assembly and

installation of existing remote dictating machine, and laundry equipment, required to be relocated.

- F. All service lines such as noted above for relocated equipment shall be in place at point of relocation ready for use before any existing equipment is disconnected. Make relocated existing equipment ready for operation or use immediately after reinstallation.

1.28 STORAGE SPACE FOR DEPARTMENT OF VETERANS AFFAIRS EQUIPMENT

- A. Contractor shall complete space in building accessible from ground level without use of elevators for storage of certain materials and equipment by Department of Veterans Affairs.
1. Provide such space with adequate light, ventilation and heat in season and lock for adequate security. Contractor shall also install and connect portion of nearest specified fire protection system including all apparatus for instant use to provide water for adequate fire protection of storage space.
 2. Storage space shall be turned over to Contracting Officer ninety days prior to Completion Date of the buildings involved.
 3. Forward two sets of drawings to Contracting Officer through the 120 days prior to Completion Date of building; drawings shall indicate those areas which will be made available to Department of Veterans Affairs for temporary storage.
 4. All cost for utility services for such storage space shall be borne by Contractor until entire building is turned over for occupancy.
- B. "Completion Date" shall mean that date as established by Contracting Officer upon which Contractor will turn over entire project or portions thereof to the Government.

1.29 CONSTRUCTION SIGN

- A. Provide a Construction Sign where directed by the COR . All wood members shall be of framing lumber. Cover sign frame with 24 gage galvanized sheet steel nailed securely around edges and on all bearings. Provide three 4 inch by 4 inch posts (or equivalent round posts) set four feet into ground. Set bottom of sign level at three feet above ground and secure to posts with through bolts. Make posts full height of sign. Brace posts with two by four inch material as directed.
- B. Paint all surfaces of sign and posts two coats of white gloss paint. Border and letters shall be of black gloss paint, except project title which shall be blue gloss paint.
- C. Maintain sign and remove it when directed by the COR .
- D. Detail Drawing of construction sign showing required legend and other characteristics of sign is shown on the drawings.

1.30 SAFETY SIGN

- A. Install all signs necessary to comply with OSHA and other applicable regulations.
- B. Provide safeguards, including warning signs, barricades, warning lights, and other similar items as required for protection of all personnel during demolition, removal, and installation operations.
- C. Maintain signage and remove sign(s) when directed by Project Manager.
- D. Provide a Safety Sign where directed by COR. Face of sign shall be 3/4 inch thick exterior grade plywood. Provide two four by four inch posts extending full height of sign and three feet into ground. Set bottom of sign level at four feet above ground.
- E. Paint all surfaces of Safety Sign and posts with one prime coat and two coats of white gloss paint. Letters and design shall be painted with gloss paint of colors noted.
- F. Maintain sign and remove it when directed by COR.

G. Standard Detail Drawing Number SD10000-02(Found on VA TIL) of safety sign showing required legend and other characteristics of sign is shown on the drawings.

H. Post the number of accident free days on a daily basis.

1.31 PHOTOGRAPHIC DOCUMENTATION (NOT USED)

1.33 HISTORIC PRESERVATION

Where the Contractor or any of the Contractor's employees, prior to, or during the construction work, are advised of or discover any possible archeological, historical and/or cultural resources, the Contractor shall immediately notify the COR verbally, and then with a written follow up.

1.34 TOUR OF DUTY

A. All work shall be done during normal Medical Center duty hours, Monday through Friday, 8:00 am to 4:30 PM, excluding federal holidays, except as follows:

1. Work that requires systems to be shut down may be required to be performed during other than normal working hours, including early mornings, evenings, nights, weekends, or holidays. All utility shutdowns shall occur only after approval is given by the Resident Engineer.
2. Work that interferes with normal VA functions shall be accomplished during other than normal working hours at a time least inconvenient to the hospital operations. This may include early mornings, evenings, nights, weekends, and/or holidays.
3. The contractor may request to work other than normal duty hours with the approval of the Resident Engineer only. Requests to work other than normal duty hours must be submitted to the Resident Engineer in writing. Approval or rejection of such requests will depend on convenience to the government.

1.35 LOCKOUT/TAGOUT POLICY

The contractor shall observe and comply with the station's lockout/tagout policy. As a minimum every affected person shall apply its own lock(s) on every point of potential

energy such that every effected person is protected from all potential sources of energy by its own lock. Each lock shall be permanently identified to each affected person. The key for each affected person's lock shall remain solely with the effected person. No one other than the effected person may remove its lock. All affected persons shall remove their locks prior to leaving the Medical Center. If a person leaves the Medical Center without removing its lock(s), then that person will be required to return to the Medical Center and remove its lock(s) at no cost to the Government. If the affected person is not available, then the lock(s) shall be removed in accordance with the Medical Center's lockout/tagout policy at no cost to the Government. A copy of this policy is available from the Resident Engineer upon request.

1.36 COMPLIANCE WITH CODES AND REGULATIONS

All work shall be conducted and all materials handled in accordance with all codes including, but not limited to, the Occupational Safety and Health Act, the International Fire Code, the International Building Code, the Life Safety Code, Uniform Federal Accessibility Standards, and the Environmental Protection Act, latest editions.

1.37 MATERIAL SAFETY AND HEALTH CONSIDERATIONS

The following considerations are applicable to all Specification Sections:

The intent of this specification is to provide materials, adhesives and solvents, which are safe and environmentally responsible products. All materials, adhesives, solvents, and coatings shall be formulated to conform to the most stringent ecological, air quality, toxicity, flammability, and safety regulations in the event of any conflict herein. Provide low "Volatile Organic Compound" (VOC) compliant materials, adhesives, and solvents of quality and performance as specified. Out gassing materials, known or suspected carcinogens, and allergenic (i.e.: formaldehyde, lead, zinc chromate) or otherwise long-term health threatening materials are to be avoided in enclosed areas whenever possible. Provide material safety data sheets with submittals for review. Inform the Project Engineer/Architect of any suspect materials.

1.38 UNKNOWN ASBESTOS

The Contractor shall notify all workers that unknown asbestos could be encountered that has not been previously identified in the Contract Documents. In the event a suspect asbestos containing material is encountered during the construction, the Contractor shall immediately vacate the area and contact the Resident Engineer before proceeding further for appropriate testing and abatement procedures.

1.39 INSPECTIONS

The government will perform periodic inspections during the construction. These inspections are for the sole benefit of the government and in no way relieve the contractor of the responsibility of maintaining an adequate inspection and quality control system. The government will conduct a final inspection and may conduct other inspections during which a punch list is generated (i.e. above ceiling inspection, roof inspection, exterior inspection, etc.). The contractor is to notify the contracting officer, in writing, when he will be ready for a government inspection. The contractor is required to have all work to be inspected completed prior to a government inspection. Prior to the final inspection, the contractor may request a pre-final inspection be conducted by the government. Provided the government has adequate time, the project COTR will walk thru the project with the contractor and point out items that need completion or correction. The contractor will be responsible for taking notes or marking items during this walk thru. The government will not create a punch list during this walk thru. Prior to the final inspection for a given project or phase, the contractor is required to have all work required by the contract for the project or phase completed. During the final inspection, a punch list of correction items will be generated. It typically requires 2-3 days following the final inspection before a typed punch list is available. Final payment will not be made until all punch list items are properly corrected.

1.40 MODIFICATIONS DUE TO EQUIPMENT CHANGES

- A. The project has been designed around specific equipment as listed in the equipment schedules. This is not meant to limit the equipment to be used on the project. It is a

necessity of design. Other equipment is permitted to be used, provided it meets the requirement to be equal to the basis-of-design equipment; however, the Contractor is responsible for determining if using a different piece of equipment will require changes to the design (i.e. change in electrical requirements, space requirements, etc.). The Contractor is responsible for affecting any necessary changes and for any and all costs related to changes necessitated by using different equipment than the basis- of-design equipment.

1.41 MINIMUM CLEANLINESS FOR TURNOVER OF AREA

A. DESCRIPTION OF SERVICES. The Contractor shall provide all management, tools, equipment, supplies, materials, and labor necessary to ensure the following custodial services are performed.

1. Hard Floors. All floors, except carpeted areas, shall be swept, dust mopped, damp mopped, wet mopped, and waxed (floor finish), to ensure they have a uniform, glossy appearance and are free of dirt, debris, dust, scuff marks, heel marks, other stains, and discoloration, and other foreign matter. Mondo Floors shall be scuff free and a floor finish called Taski Vision Matte shall be applied to the surface to present a Matte Shine. Vinyl Composite Tile floors shall be scuff free and a floor finish called Spartan IShine applied to the surface to present a glossy appearance.
2. Vacuum Carpets. Vacuum carpeted areas. After vacuuming, the areas shall be free of all visible dirt, debris, litter, and other foreign matter. Any spots shall be removed by carpet manufacturer's approved methods as soon as noticed.
3. Clean Interior Glass/Mirrors. Clean all interior glass, including glass in doors, partitions, walls, display cases, directory boards, windbreaks at entrances, mirrors, etc. After glass cleaning, there shall be no traces of film, dirt, smudges, water, or other foreign matter. All adjacent sills, frames, ledges, etc. shall be cleaned.
4. Clean Drinking Fountains. Clean and disinfect all porcelain and polished metal surfaces, including the orifices and drains, as well as exterior surfaces of fountains.

Drinking fountains shall be free of streaks, stains, spots, smudges, scale, and other obvious soil.

5. General Dusting. All horizontal surfaces from eight (8) feet to twenty (20) feet above the floor level must be dusted or cleaned to eliminate dust collection, to include window blinds. Typewriters, copier machines, and equipment of similar nature shall not be dusted. Surfaces eight (8) feet and below are included in "Low Dust". Surfaces above eight (8) feet to twenty (20) feet are included in "High Dust".

6. Clean and Disinfect. Completely clean and disinfect all surfaces of sinks, toilet bowls, urinals, lavatories, showers, shower mats, dispensers, mirrors, plumbing fixtures, saunas, partitions, doors, walls, and other such surfaces, using a germicidal detergent. After cleaning, surfaces will be free of deposits, dirt, streaks, stains, scale, scum, and odors. Disinfect all surfaces of partitions, stalls, stall doors, entry doors, (including handles, kick plates, ventilation grates, metal guards, etc.), and wall areas adjacent to wall mounted lavatories, urinals, and toilets.

1.42 SCHEDULE

FAR 52.211 10 Commencement, Prosecution and Completion of the Work:

The Contractor shall be required to:

- a. Commence work under this Contract within 10 calendar days after the date the Contractor receives the notice to proceed;
- b. Prosecute the work diligently; and
- c. Complete the entire work ready for use not later than 487 calendar days after receipt of notice to proceed for Phase 1. The time stated for completion shall include final cleanup of the premises.

The total period of performance is defined below and a separate NTP will be issued for each phase:

1. Phase 1 – Submittals – 60 calendar days after Phase 1 Notice to Proceed. Please note that Safety and Schedule submittals shall be submitted in a timely enough manner, sufficient to allow for review and approval by the government of at least 21 calendar days at each iteration. The time for the Safety and Schedule submittals is concurrent with the time for Material submittals.
2. Phase 2 – Physical Construction – The Notice to Proceed for physical construction will be issued upon receipt and approval of the safety and schedule submittals and receipt of 100% of all material submittals and approval of at least 50% of the material submittals. The period of performance of Phase 2 will be the number of calendar days remaining between the date of the Phase 2 Notice to Proceed and the Contract end date established by the Phase 1 Notice to Proceed. Determination of whether or not 50% of the Material submittals are approved is the sole right of the government.
3. Overall Project Period: 487 calendar days after Phase 1 Notice to Proceed

1.42.1 RESPONSIBILITY FOR COMPLETION

- A. If it becomes apparent from the current progress schedule that phasing or Contract completion dates will not be met, the Contractor shall execute some or all of the following remedial actions:
 1. Increase construction manpower in such quantities and crafts as necessary to eliminate the backlog of work.
 2. Increase the number of working hours per shift, shifts per working day, working days per week, the amount of construction equipment, or any combination of the foregoing to eliminate the backlog of work.
 3. Reschedule the work in conformance with the Specification requirements.
- B. Prior to proceeding with any of the above actions, the Contractor shall notify and obtain approval from the COR for the proposed schedule changes. If such actions are approved, the representative schedule revisions shall be incorporated by the Contractor

into the Project Schedule before the next update, at no additional cost to the Government.

1.42.2 CHANGES TO THE SCHEDULE

- A. Within 10 calendar days after VA acceptance and approval of any updated project schedule, the Contractor shall submit a revised electronic file(s) and a list of any activity/event changes including predecessors and successors for any of the following reasons:
 - 1. Delay in completion of any activity/event or group of activities/events, which may be involved with Contract changes, strikes, unusual weather, and other delays will not relieve the Contractor from the requirements specified unless the conditions are shown on the CPM as the direct cause for delaying the project beyond the acceptable limits.
 - 2. Delays in submittals or deliveries, or work stoppage are encountered which make rescheduling of the work necessary.
 - 3. The schedule does not represent the actual prosecution and progress of the project.
 - 4. When there is, or has been, a substantial revision to the activity/event costs regardless of the cause for these revisions.
- B. CPM revisions made under this paragraph which affect the previously approved computer produced schedules for Government furnished equipment, vacating of areas by the VA Facility, Contract phase(s) and sub-phase(s), utilities furnished by the Government to the Contractor, or any other previously contracted item, shall be furnished in writing to the Contracting Officer for approval.
- C. Contracting Officer's approval for the revised project schedule and all relevant data is contingent upon compliance with all other paragraphs of this Section and any other previous agreements by the Contracting Officer or the VA representative.

- E. The cost of revisions to the Project Schedule not resulting from Contract changes is the responsibility of the Contractor.

1.42.3 ADJUSTMENT OF CONTRACT COMPLETION

- A. The Contract completion time will be adjusted only for causes specified in this Contract. Request for an extension of the Contract completion date by the Contractor shall be supported with a justification, CPM data and supporting evidence as the COR may deem necessary for determination as to whether or not the Contractor is entitled to an extension of time under the provisions of the Contract. Submission of proof based on revised activity/event logic, durations (in work days) and costs is obligatory to any approvals. The schedule must clearly display that the Contractor has used, in full, all the float time available for the work involved in this request. All float within this Contract is owned by the Government. The Contracting Officer's determination as to the total number of days of Contract extension will be based upon the current computer produced calendar dated schedule for the time period in question and all other relevant information.
- B. Actual delays in activities/events which, according to the computer produced calendar dated schedule, do not affect the extended and predicted Contract completion dates shown by the critical path in the network, will not be the basis for a change to the Contract completion date. The Contracting Officer will within a reasonable time after receipt of such justification and supporting evidence, review the facts and advise the Contractor in writing of the Contracting Officer's decision.
- C. The Contractor shall submit each request for a change in the Contract completion date to the Contracting Officer in accordance with the provisions specified under FAR 52.243 – 4 (Changes) and VAAR 852.236 – 88 (Changes – Supplemental). The Contractor shall include, as a part of each change order proposal, a sketch showing all CPM logic revisions, duration (in work days) changes, and cost changes, for work in question and its relationship to other activities on the approved network diagram.

- D. All delays due to non-work activities/events such as RFIs, weather, strikes, and similar non-work activities/events shall be analyzed on a month by month basis.

- - - E N D - - -

SECTION 01 32 16.15
PROJECT SCHEDULES
(SMALL PROJECTS – DESIGN/BID/BUILD)

PART 1- GENERAL

1.1 DESCRIPTION:

- A. The Contractor shall develop a Critical Path Method (CPM) plan and schedule demonstrating fulfillment of the contract requirements (Project Schedule), and shall keep the Project Schedule up-to-date in accordance with the requirements of this section and shall utilize the plan for scheduling, coordinating and monitoring work under this contract (including all activities of subcontractors, equipment vendors and suppliers). Conventional Critical Path Method (CPM) technique shall be utilized to satisfy both time and cost applications.

1.2 CONTRACTOR'S REPRESENTATIVE:

- A. The Contractor shall designate an authorized representative responsible for the Project Schedule including preparation, review and progress reporting with and to the Contracting Officer's Representative (COTR).
- B. The Contractor's representative shall have direct project control and complete authority to act on behalf of the Contractor in fulfilling the requirements of this specification section.
- C. The Contractor's representative shall have the option of developing the project schedule within their organization or to engage the services of an outside consultant. If an outside scheduling consultant is utilized, Section 1.3 of this specification will apply.

1.3 CONTRACTOR'S CONSULTANT (NOT USED)

1.4 COMPUTER PRODUCED SCHEDULES

- A. The contractor shall provide monthly, to the Department of Veterans Affairs (VA), all computer-produced time/cost schedules and reports generated from monthly project updates. This monthly computer service will include: three copies of up to five different reports (inclusive of all pages) available within the user defined reports of the

scheduling software approved by the Contracting Officer; a hard copy listing of all project schedule changes, and associated data, made at the update and an electronic file of this data; and the resulting monthly updated schedule in PDM format. These must be submitted with and substantively support the contractor's monthly payment request and the signed look ahead report. The COTR shall identify the five different report formats that the contractor shall provide.

- B. The contractor shall be responsible for the correctness and timeliness of the computer-produced reports. The Contractor shall also responsible for the accurate and timely submittal of the updated project schedule and all CPM data necessary to produce the computer reports and payment request that is specified.
- C. The VA will report errors in computer-produced reports to the Contractor's representative within ten calendar days from receipt of reports. The Contractor shall reprocess the computer-produced reports and associated diskette(s), when requested by the Contracting Officer's representative, to correct errors which affect the payment and schedule for the project.

1.5 THE COMPLETE PROJECT SCHEDULE SUBMITTAL

- A. Within 10 calendar days after receipt of Notice to Proceed, the Contractor shall submit for the Contracting Officer's review; an electronic file in the previously approved CPM schedule program. The submittal shall also include three copies of a computer-produced activity/event ID schedule showing project duration; phase completion dates; and other data, including event cost. Each activity/event on the computer-produced schedule shall contain as a minimum, but not limited to, activity/event ID, activity/event description, duration, budget amount, early start date, early finish date, late start date, late finish date and total float. Work activity/event relationships shall be restricted to finish-to-start or start-to-start without lead or lag constraints. Activity/event date constraints, not required by the contract, will not be accepted unless submitted to and approved by the Contracting Officer. The contractor shall make a separate written detailed request to the Contracting Officer identifying these date constraints and secure the Contracting Officer's written approval before incorporating them into the network diagram. The

Contracting Officer's separate approval of the Project Schedule shall not excuse the contractor of this requirement. Logic events (non-work) will be permitted where necessary to reflect proper logic among work events, but must have zero duration. The complete working schedule shall reflect the Contractor's approach to scheduling the complete project. **The final Project Schedule in its original form shall contain no contract changes or delays which may have been incurred during the final network diagram development period and shall reflect the entire contract duration as defined in the bid documents.** These changes/delays shall be entered at the first update after the final Project Schedule has been approved. The Contractor should provide their requests for time and supporting time extension analysis for contract time as a result of contract changes/delays, after this update, and in accordance with Article, ADJUSTMENT OF CONTRACT COMPLETION.

- B. Within 30 calendar days after receipt of the complete project interim Project Schedule and the complete final Project Schedule, the Contracting Officer or his representative, will do one or both of the following:
 - 1. Notify the Contractor concerning his actions, opinions, and objections.
 - 2. A meeting with the Contractor at or near the job site for joint review, correction or adjustment of the proposed plan will be scheduled if required. Within 14 calendar days after the joint review, the Contractor shall revise and shall submit three blue line copies of the revised Project Schedule, three copies of the revised computer-produced activity/event ID schedule and a revised electronic file as specified by the Contracting Officer. The revised submission will be reviewed by the Contracting Officer and, if found to be as previously agreed upon, will be approved.
- C. The approved baseline schedule and the computer-produced schedule(s) generated there from shall constitute the approved baseline schedule until subsequently revised in accordance with the requirements of this section.

1.6 WORK ACTIVITY/EVENT COST DATA

- A. The Contractor shall cost load all work activities/events except procurement activities. The cumulative amount of all cost loaded work activities/events (including alternates)

shall equal the total contract price. Prorate overhead, profit and general conditions on all work activities/events for the entire project length. The contractor shall generate from this information cash flow curves indicating graphically the total percentage of work activity/event dollar value scheduled to be in place on early finish, late finish. These cash flow curves will be used by the Contracting Officer to assist him in determining approval or disapproval of the cost loading. Negative work activity/event cost data will not be acceptable, except on VA issued contract changes.

- B. The Contractor shall cost load work activities/events for guarantee period services, test, balance and adjust various systems in accordance with the provisions in Article, FAR 52.232 – 5 (PAYMENT UNDER FIXED-PRICE CONSTRUCTION CONTRACTS) and VAAR 852.232 – Article 70 Without NAS-CPM/for (PAYMENTS UNDER FIXED PRICE CONSTRUCTION).
- C. In accordance with FAR 52.236 – 1 (PERFORMANCE OF WORK BY THE CONTRACTOR) and VAAR 852.236 – 72 (PERFORMANCE OF WORK BY THE CONTRACTOR), the Contractor shall submit, simultaneously with the cost per work activity/event of the construction schedule required by this Section, a responsibility code for all activities/events of the project for which the Contractor's forces will perform the work.
- D. The Contractor shall cost load work activities/events for all BID ITEMS including ASBESTOS ABATEMENT. The sum of each BID ITEM work shall equal the value of the bid item in the Contractors' bid.

1.7 PROJECT SCHEDULE REQUIREMENTS

- A. Show on the project schedule the sequence of work activities/events required for complete performance of all items of work. The Contractor Shall:
 - 1. Show activities/events as:
 - a. Contractor's time required for submittal of shop drawings, templates, fabrication, delivery and similar pre-construction work.
 - b. Contracting Officer's and Architect-Engineer's review and approval of shop drawings, equipment schedules, samples, template, or similar items.

- c. Interruption of VA Facilities utilities, delivery of Government furnished equipment, and rough-in drawings, project phasing and any other specification requirements.
 - d. Test, balance and adjust various systems and pieces of equipment, maintenance and operation manuals, instructions and preventive maintenance tasks.
 - e. VA inspection and acceptance activity/event with a minimum duration of five work days at the end of each phase and immediately preceding any VA move activity/event required by the contract phasing for that phase.
 - 2. Show not only the activities/events for actual construction work for each trade category of the project, but also trade relationships to indicate the movement of trades from one area, floor, or building, to another area, floor, or building, for at least five trades who are performing major work under this contract.
 - 3. Break up the work into activities/events of a duration no longer than 20 work days each or one reporting period, except as to non-construction activities/events (i.e., procurement of materials, delivery of equipment, concrete and asphalt curing) and any other activities/events for which the COTR may approve the showing of a longer duration. The duration for VA approval of any required submittal, shop drawing, or other submittals will not be less than 20 work days.
 - 4. Describe work activities/events clearly, so the work is readily identifiable for assessment of completion. Activities/events labeled "start," "continue," or "completion," are not specific and will not be allowed. Lead and lag time activities will not be acceptable.
 - 5. The schedule shall be generally numbered in such a way to reflect either discipline, phase or location of the work.
- B. The Contractor shall submit the following supporting data in addition to the project schedule:
- 1. The appropriate project calendar including working days and holidays.
 - 2. The planned number of shifts per day.

3. The number of hours per shift.

Failure of the Contractor to include this data shall delay the review of the submittal until the Contracting Officer is in receipt of the missing data.

- C. To the extent that the Project Schedule or any revised Project Schedule shows anything not jointly agreed upon, it shall not be deemed to have been approved by the COTR. Failure to include any element of work required for the performance of this contract shall not excuse the Contractor from completing all work required within any applicable completion date of each phase regardless of the COTR's approval of the Project Schedule.
- D. Compact Disk Requirements and CPM Activity/Event Record Specifications: Submit to the VA an electronic file(s) containing one file of the data required to produce a schedule, reflecting all the activities/events of the complete project schedule being submitted.

1.8 PAYMENT TO THE CONTRACTOR:

- A. Monthly, the contractor shall submit an application and certificate for payment using VA Form 10-6001a reflecting updated schedule activities and cost data in accordance with the provisions of the following Article, PAYMENT AND PROGRESS REPORTING, as the basis upon which progress payments will be made pursuant to Article, FAR 52.232 – 5 (PAYMENT UNDER FIXED-PRICE CONSTRUCTION CONTRACTS) and VAAR 852.232 – Article 70 Without NAS-CPMfor (PAYMENTS UNDER FIXED PRICE CONSTRUCTION). The Contractor shall be entitled to a monthly progress payment upon approval of estimates as determined from the currently approved updated project schedule. Monthly payment requests shall include: a listing of all agreed upon project schedule changes and associated data; and an electronic file (s) of the resulting monthly updated schedule.
- B. Approval of the Contractor's monthly Application for Payment shall be contingent, among other factors, on the submittal of a satisfactory monthly update of the project schedule.

1.9 PAYMENT AND PROGRESS REPORTING

- A. Monthly schedule update meetings will be held on dates mutually agreed to by the COTR and the Contractor. Contractor and their CPM consultant (if applicable) shall attend all monthly schedule update meetings. The Contractor shall accurately update the Project Schedule and all other data required and provide this information to the COTR three work days in advance of the schedule update meeting. Job progress will be reviewed to verify:
1. Actual start and/or finish dates for updated/completed activities/events.
 2. Remaining duration for each activity/event started, or scheduled to start, but not completed.
 3. Logic, time and cost data for change orders, and supplemental agreements that are to be incorporated into the Project Schedule.
 4. Changes in activity/event sequence and/or duration which have been made, pursuant to the provisions of following Article, ADJUSTMENT OF CONTRACT COMPLETION.
 5. Completion percentage for all completed and partially completed activities/events.
 6. Logic and duration revisions required by this section of the specifications.
 7. Activity/event duration and percent complete shall be updated independently.
- B. After completion of the joint review, the contractor shall generate an updated computer-produced calendar-dated schedule and supply the Contracting Officer's representative with reports in accordance with the Article, COMPUTER PRODUCED SCHEDULES, specified.
- C. After completing the monthly schedule update, the contractor's representative or scheduling consultant shall rerun all current period contract change(s) against the prior approved monthly project schedule. The analysis shall only include original workday durations and schedule logic agreed upon by the contractor and Contracting Officer Representative (COR) for the contract change(s). When there is a disagreement on logic and/or durations, the Contractor shall use the schedule logic and/or durations provided and approved by the COR. After each rerun update, the resulting electronic project schedule data file shall be appropriately identified and submitted to the VA in

accordance to the requirements listed in articles 1.4 and 1.7. This electronic submission is separate from the regular monthly project schedule update requirements and shall be submitted to the COR within fourteen (14) calendar days of completing the regular schedule update. **Before inserting the contract changes durations, care must be taken to ensure that only the original durations will be used for the analysis, not the reported durations after progress. In addition, once the final network diagram is approved, the contractor must recreate all manual progress payment updates on this approved network diagram and associated reruns for contract changes in each of these update periods as outlined above for regular update periods. This will require detailed record keeping for each of the manual progress payment updates.**

- D. Following approval of the CPM schedule, the VA, the General Contractor, its approved CPM Consultant, RE office representatives, and all subcontractors needed, as determined by the SRE, shall meet to discuss the monthly updated schedule. The main emphasis shall be to address work activities to avoid slippage of project schedule and to identify any necessary actions required to maintain project schedule during the reporting period. The Government representatives and the Contractor should conclude the meeting with a clear understanding of those work and administrative actions necessary to maintain project schedule status during the reporting period. This schedule coordination meeting will occur after each monthly project schedule update meeting utilizing the resulting schedule reports from that schedule update. If the project is behind schedule, discussions should include ways to prevent further slippage as well as ways to improve the project schedule status, when appropriate.

1.10 RESPONSIBILITY FOR COMPLETION

- A. If it becomes apparent from the current revised monthly progress schedule that phasing or contract completion dates will not be met, the Contractor shall execute some or all of the following remedial actions:
1. Increase construction manpower in such quantities and crafts as necessary to eliminate the backlog of work.

2. Increase the number of working hours per shift, shifts per working day, working days per week, the amount of construction equipment, or any combination of the foregoing to eliminate the backlog of work.
 3. Reschedule the work in conformance with the specification requirements.
- B. Prior to proceeding with any of the above actions, the Contractor shall notify and obtain approval from the COTR for the proposed schedule changes. If such actions are approved, the representative schedule revisions shall be incorporated by the Contractor into the Project Schedule before the next update, at no additional cost to the Government.
- C. All contract work, in each phase, including final inspection and punch list items impacting unobstructed use of the area(s), of that phase, shall be completed by the Contractor prior to turning over the area(s) to the VA for their 21 calendar day equipment relocation and occupancy. It will be at the discretion of the VA as to which punch list items prevent unobstructed use of the area(s) of phases. All phase work must be completed, including all punch list items, within the overall project period timeframe.

1.11 CHANGES TO THE SCHEDULE

- A. Within 30 calendar days after VA acceptance and approval of any updated project schedule, the Contractor shall submit a revised electronic file (s) and a list of any activity/event changes including predecessors and successors for any of the following reasons:
1. Delay in completion of any activity/event or group of activities/events, which may be involved with contract changes, strikes, unusual weather, and other delays will not relieve the Contractor from the requirements specified unless the conditions are shown on the CPM as the direct cause for delaying the project beyond the acceptable limits.
 2. Delays in submittals, or deliveries, or work stoppage are encountered which make rescheduling of the work necessary.
 3. The schedule does not represent the actual prosecution and progress of the project.

4. When there is, or has been, a substantial revision to the activity/event costs regardless of the cause for these revisions.
- B. CPM revisions made under this paragraph which affect the previously approved computer-produced schedules for Government furnished equipment, vacating of areas by the VA Facility, contract phase(s) and sub phase(s), utilities furnished by the Government to the Contractor, or any other previously contracted item, shall be furnished in writing to the Contracting Officer for approval.
- C. Contracting Officer's approval for the revised project schedule and all relevant data is contingent upon compliance with all other paragraphs of this section and any other previous agreements by the Contracting Officer or the VA representative.
- D. The cost of revisions to the project schedule resulting from contract changes will be included in the proposal for changes in work as specified in FAR 52.243 – 4 (Changes, and will be based on the complexity of the revision or contract change, man hours expended in analyzing the change, and the total cost of the change.
- E. The cost of revisions to the Project Schedule not resulting from contract changes is the responsibility of the Contractor.

1.12 ADJUSTMENT OF CONTRACT COMPLETION

- A. The contract completion time will be adjusted only for causes specified in this contract. Request for an extension of the contract completion date by the Contractor shall be supported with a justification, CPM data and supporting evidence as the COTR may deem necessary for determination as to whether or not the Contractor is entitled to an extension of time under the provisions of the contract. Submission of proof based on revised activity/event logic, durations (in work days) and costs is obligatory to any approvals. The schedule must clearly display that the Contractor has used, in full, all the float time available for the work involved in this request. The Contracting Officer's determination as to the total number of days of contract extension will be based upon the current computer-produced calendar-dated schedule for the time period in question and all other relevant information.

- B. Actual delays in activities/events which, according to the computer- produced calendar-dated schedule, do not affect the extended and predicted contract completion dates shown by the critical path in the network, will not be the basis for a change to the contract completion date. The Contracting Officer will within a reasonable time after receipt of such justification and supporting evidence, review the facts and advise the Contractor in writing of the Contracting Officer's decision.
- C. The Contractor shall submit each request for a change in the contract completion date to the Contracting Officer in accordance with the provisions specified under FAR 52.243 – 4 (Changes). The Contractor shall include, as a part of each change order proposal, a sketch showing all CPM logic revisions, duration (in work days) changes, and cost changes, for work in question and its relationship to other activities on the approved network diagram.
- D. All delays due to non-work activities/events such as RFI's, WEATHER, STRIKES, and similar non-work activities/events shall be analyzed on a month by month basis.

--- E N D ---

SECTION 01 33 23

SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

PART 1 – GENERAL

1.1 DESCRIPTION

- A. This specification defines the general requirements and procedures for submittals. A submittal is information submitted for VA review to establish compliance with the contract documents.
- B. Detailed submittal requirements are found in the technical sections of the contract specifications. The Contracting Officer may request submittals in addition to those specified when deemed necessary to adequately describe the work covered in the respective technical specifications at no additional cost to the government.
- C. VA approval of a submittal does not relieve the Contractor of the responsibility for any error which may exist. The Contractor is responsible for fully complying with all contract requirements and the satisfactory construction of all work, including the need to check, confirm, and coordinate the work of all subcontractors for the project. Non-compliant material incorporated in the work will be removed and replaced at the Contractor's expense.

1.2 DEFINITIONS

- A. Preconstruction Submittals: Submittals which are required prior to issuing contract notice to proceed or starting construction. For example, Certificates of insurance; Surety bonds; Site-specific safety plan; Construction progress schedule; Schedule of values; Submittal register; List of proposed subcontractors.
- B. Shop Drawings: Drawings, diagrams, and schedules specifically prepared to illustrate some portion of the work. Drawings prepared by or for the Contractor to show how multiple systems and interdisciplinary work will be integrated and coordinated.
- C. Product Data: Catalog cuts, illustrations, schedules, diagrams, performance charts, instructions, and brochures, which describe and illustrate size, physical appearance, and

other characteristics of materials, systems, or equipment for some portion of the work.

Samples of warranty language when the contract requires extended product warranties.

- D. Samples: Physical examples of materials, equipment, or workmanship that illustrate functional and aesthetic characteristics of a material or product and establish standards by which the work can be judged. Color samples from the manufacturer's standard line (or custom color samples if specified) to be used in selecting or approving colors for the project. Field samples and mock-ups constructed to establish standards by which the ensuing work can be judged.
- E. Design Data: Calculations, mix designs, analyses, or other data pertaining to a part of work.
- F. Test Reports: Report which includes findings of a test required to be performed by the Contractor on an actual portion of the work. Report which includes finding of a test made at the job site or on sample taken from the job site, on portion of work during or after installation.
- G. Certificates: Document required of Contractor, or of a manufacturer, supplier, installer, or subcontractor through Contractor. The purpose is to document procedures, acceptability of methods, or personnel qualifications for a portion of the work.
- H. Manufacturer's Instructions: Pre-printed material describing installation of a product, system, or material, including special notices and MSDS concerning impedances, hazards, and safety precautions.
- I. Manufacturer's Field Reports: Documentation of the testing and verification actions taken by manufacturer's representative at the job site on a portion of the work, during or after installation, to confirm compliance with manufacturer's standards or instructions. The documentation must indicate whether the material, product, or system has passed or failed the test.
- J. Operation and Maintenance Data: Manufacturer data that is required to operate, maintain, troubleshoot, and repair equipment, including manufacturer's help, parts list,

and product line documentation. This data shall be incorporated in an operations and maintenance manual.

- K. Closeout Submittals: Documentation necessary to properly close out a construction contract. For example, Record Drawings and as-built drawings. Also, submittal requirements necessary to properly close out a phase of construction on a multi-phase contract.

1.3 SUBMITTAL REGISTER

- A. The submittal register will list items of equipment and materials for which submittals are required by the specifications. This list may not be all inclusive and additional submittals may be required by the specifications. The Contractor is not relieved from supplying submittals required by the contract documents but which have been omitted from the submittal register.
- B. The submittal register will serve as a scheduling document for submittals and will be used to control submittal actions throughout the contract period.
- C. The VA will provide the initial submittal register in electronic format. Thereafter, the Contractor shall track all submittals by maintaining a complete list, including completion of all data columns, including dates on which submittals are received and returned by the VA.
- D. The Contractor shall update the submittal register as submittal actions occur and maintain the submittal register at the project site until final acceptance of all work by Contracting Officer.
- E. The Contractor shall submit formal monthly updates to the submittal register in electronic format. Each monthly update shall document actual submission and approval dates for each submittal.

1.4 SUBMITTAL SCHEDULING

- A. Submittals are to be scheduled, submitted, reviewed, and approved prior to the acquisition of the material or equipment.

- B. Coordinate scheduling, sequencing, preparing, and processing of submittals with performance of work so that work will not be delayed by submittal processing. Allow time for potential resubmittal.
- C. No delay costs or time extensions will be allowed for time lost in late submittals or resubmittals.
- D. All submittals are required to be approved prior to the start of the specified work activity.
- E. It is strongly suggested that the contractor submit long lead items for approval early in the project to avoid project delays due to untimely submission of submittals.
- F. An updated progress schedule is to be provided prior to the submittal of each request for payment. The updated schedule is to show all activities started and/or completed during the reporting period and a projection of the activities that will take place during the following reporting period.
- G. Allow a minimum of 21 days for submittal review from the time the submittals are received by the Architect until they are returned by the Resident Engineer to the contractor. Submittals on finishes related to textures, patterns, and colors of materials shall be submitted as one complete package so that all finish materials may be coordinated and selected at one time.

1.5 SUBMITTAL PREPARATION

- A. Each submittal is to be complete and in sufficient detail to allow ready determination of compliance with contract requirements.
- B. Collect required data for each specific material, product, unit of work, or system into a single submittal. Prominently mark choices, options, and portions applicable to the submittal. Partial submittals will not be accepted for expedition of construction effort. Submittal will be returned without review if incomplete.
- C. If available product data is incomplete, provide Contractor-prepared documentation to supplement product data and satisfy submittal requirements.

- D. All irrelevant or unnecessary data shall be removed from the submittal to facilitate accuracy and timely processing. Submittals that contain the excessive amount of irrelevant or unnecessary data will be returned with review.
- E. Provide a transmittal form for each submittal with the following information:
 - 1. Project title, location and number.
 - 2. Construction contract number.
 - 3. Date of the drawings and revisions.
 - 4. Name, address, and telephone number of subcontractor, supplier, manufacturer, and any other subcontractor associated with the submittal.
 - 5. List paragraph number of the specification section and sheet number of the contract drawings by which the submittal is required.
 - 6. When a resubmission, add alphabetic suffix on submittal description. For example, submittal 18 would become 18A, to indicate resubmission.
 - 7. Product identification and location in project.
- F. The Contractor is responsible for reviewing and certifying that all submittals are in compliance with contract requirements before submitting for VA review. Proposed deviations from the contract requirements are to be clearly identified. All deviations submitted must include a side by side comparison of item being proposed against item specified. Failure to point out deviations will result in the VA requiring removal and replacement of such work at the Contractor's expense.
- G. Stamp, sign, and date each submittal transmittal form indicating action taken.
- H. Stamp used by the Contractor on the submittal transmittal form to certify that the submittal meets contract requirements is to be similar to the following:

	CONTRACTOR	
	(Firm Name)	
	_____Approved	
	_____Approved with corrections as noted on submittal data and/or	
	attached sheets(s)	
	SIGNATURE: _____	
	TITLE: _____	
	DATE: _____	

1.6 SUBMITTAL FORMAT AND TRANSMISSION

- A. Provide submittals in electronic format, with the exception of material samples. Use PDF as the electronic format, unless otherwise specified or directed by the Contracting Officer.

- B. Compile the electronic submittal file as a single, complete document. Name the electronic submittal file specifically according to its contents.
- C. Electronic files must be of sufficient quality that all information is legible. Generate PDF files from original documents so that the text included in the PDF file is both searchable and can be copied. If documents are scanned, Optical Character Resolution (OCR) routines are required.
- E. Provide all electronic documents through an electronic FTP file sharing system. Confirm that the electronic FTP file sharing system can be accessed from the VA computer network. The Contractor is responsible for setting up, providing, and maintaining the electronic FTP file sharing system for the construction contract period of performance.
- F. Provide hard copies of submittals when requested by the Contracting Officer. Up to 3 additional hard copies of any submittal may be requested at the discretion of the Contracting Officer, at no additional cost to the VA.
- G. Any deviations from the contract requirements and justification therefore shall be so stated in the letter of transmittal.
- H. No fabrication of work shall be done or any part of parts thereof shipped to the site prior to approval of required shop drawings for such work.
- I. VA approval of samples, certificates, manufacturers' literature and data, and shop drawings will be subject to contract requirements and shall not relieve the contractor from responsibility for errors of any sort in such submittals or from any unauthorized deviations from contract requirements. An authorized deviation is a deviation that has been identified by the contractor, or Government, and confirmed by an appropriate contract modification.

1.7 SAMPLES

- A. Submit two sets of physical samples showing range of variation, for each required item.
- B. Where samples are specified for selection of color, finish, pattern, or texture, submit the full set of available choices for the material or product specified.

- C. When color, texture, or pattern is specified by naming a particular manufacturer and style, include one sample of that manufacturer and style, for comparison.
- D. Before submitting samples, the Contractor is to ensure that the materials or equipment will be available in quantities required in the project. No change or substitution will be permitted after a sample has been approved.
- E. The VA reserves the right to disapprove any material or equipment which previously has proven unsatisfactory in service.
- F. Physical samples supplied maybe requested back for use in the project after reviewed and approved.

1.8 OPERATION AND MAINTENANCE DATA

- A. Submit data specified for a given item within 30 calendar days after the item is delivered to the contract site.
- B. In the event the Contractor fails to deliver O&M Data within the time limits specified, the Contracting Officer may withhold from progress payments 50 percent of the price of the item with which such O&M Data are applicable.

1.9 TEST REPORTS

SRE may require specific test after work has been installed or completed which could require contractor to repair test area at no additional cost to contract.

1.10 VA REVIEW OF SUBMITTALS AND RFIS

- A. The VA will review all submittals for compliance with the technical requirements of the contract documents. The Architect-Engineer for this project will assist the VA in reviewing all submittals and determining contractual compliance. Review will be only for conformance with the applicable codes, standards and contract requirements.
- B. Period of review for submittals begins when the VA COR receives submittal from the Contractor.
- C. Period of review for each resubmittal is the same as for initial submittal.
- D. VA review period is 15 working days for submittals.

- E. VA review period is 10 working days for RFIs.
- F. The VA will return submittals to the Contractor with the following notations:
 - 1. "Approved": authorizes the Contractor to proceed with the work covered.
 - 2. "Approved as noted": authorizes the Contractor to proceed with the work covered provided the Contractor incorporates the noted comments and makes the noted corrections.
 - 3. "Disapproved, revise and resubmit": indicates noncompliance with the contract requirements or that submittal is incomplete. Resubmit with appropriate changes and corrections. No work shall proceed for this item until resubmittal is approved.
 - 4. "Not reviewed": indicates submittal does not have evidence of being reviewed and approved by Contractor or is not complete. A submittal marked "not reviewed" will be returned with an explanation of the reason it is not reviewed. Resubmit submittals after taking appropriate action.

1.11 APPROVED SUBMITTALS

- A. The VA approval of submittals is not to be construed as a complete check, and indicates only that the general method of construction, materials, detailing, and other information are satisfactory.
- B. VA approval of a submittal does not relieve the Contractor of the responsibility for any error which may exist. The Contractor is responsible for fully complying with all contract requirements and the satisfactory construction of all work, including the need to check, confirm, and coordinate the work of all subcontractors for the project. Non-compliant material incorporated in the work will be removed and replaced at the Contractor's expense.
- C. After submittals have been approved, no resubmittal for the purpose of substituting materials or equipment will be considered unless accompanied by an explanation of why a substitution is necessary.
- D. Retain a copy of all approved submittals at project site, including approved samples.

1.12 WITHHOLDING OF PAYMENT

Payment for materials incorporated in the work will not be made if required approvals have not been obtained.

1.13 EXCESSIVE RESUBMITTAL PENALTY

- A. The General Contractor is responsible for reviewing all submittals and coordinating them with other trades prior to submitting them for VA review. All shop drawings, product data, installation instructions, etc. shall be job specific and meet the requirements called forth in the Construction Documents. Should any given submittal require more than two resubmittals, the General Contractor will be back-charged via contracting change order on a time and materials basis for each additional review. Standard billing rates apply.

--- E N D ---

SECTION 01 35 26
SAFETY REQUIREMENTS

TABLE OF CONTENTS

1.1	APPLICABLE PUBLICATIONS	3
1.2	DEFINITIONS.....	4
1.3	REGULATORY REQUIREMENTS	6
1.4	ACCIDENT PREVENTION PLAN (APP).....	6
1.5	ACTIVITY HAZARD ANALYSES (AHAs)	12
1.6	PRECONSTRUCTION CONFERENCE	14
1.7	“SITE SAFETY AND HEALTH OFFICER” (SSHO) and “COMPETENT PERSON” (CP)	15
1.8	TRAINING	16
1.9	INSPECTIONS.....	17
1.10	ACCIDENTS, OSHA 300 LOGS, AND MAN-HOURS	18
1.11	PERSONAL PROTECTIVE EQUIPMENT (PPE)	19
1.12	INFECTION CONTROL	20
1.13	TUBERCULOSIS SCREENING.....	28
1.14	FIRE SAFETY	29
1.15	ELECTRICAL.....	31
1.16	FALL PROTECTION	33
1.17	SCAFFOLDS AND OTHER WORK PLATFORMS.....	34
1.18	EXCAVATION AND TRENCHES	35
1.19	CRANES.....	37
1.20	CONTROL OF HAZARDOUS ENERGY (LOCKOUT/TAGOUT)	38
1.21	CONFINED SPACE ENTRY	38
1.22	WELDING AND CUTTING	39
1.23	LADDERS.....	39

1.24 FLOOR & WALL OPENINGS 40

SECTION 01 35 26
SAFETY REQUIREMENTS

1.1 APPLICABLE PUBLICATIONS:

- A. Latest publications listed below form part of this Article to extent referenced.

Publications are referenced in text by basic designations only.

- B. American Society of Safety Engineers (ASSE):

A10.1-2011.....Pre-Project & Pre-Task Safety and Health Planning

A10.34-2012.....Protection of the Public on or Adjacent to Construction
Sites

A10.38-2013.....Basic Elements of an Employer's Program to Provide a Safe
and Healthful Work Environment American National
Standard Construction and Demolition Operations

- C. American Society for Testing and Materials (ASTM):

E84-2013Surface Burning Characteristics of Building Materials

- D. The Facilities Guidelines Institute (FGI):

FGI Guidelines-2010Guidelines for Design and Construction of Healthcare Facilities

- E. National Fire Protection Association (NFPA):

10-2018Standard for Portable Fire Extinguishers

30-2018Flammable and Combustible Liquids Code

51B-2019Standard for Fire Prevention During Welding, Cutting and
Other Hot Work

70-2020National Electrical Code

- 70B-2019Recommended Practice for Electrical Equipment
Maintenance
- 70E-2018Standard for Electrical Safety in the Workplace
- 99-2018Health Care Facilities Code
- 241-2019Standard for Safeguarding Construction, Alteration, and
Demolition Operations
- F. The Joint Commission (TJC)
 - TJC ManualComprehensive Accreditation and Certification Manual
- G. U.S. Nuclear Regulatory Commission
 - 10 CFR 20Standards for Protection Against Radiation
- H. U.S. Occupational Safety and Health Administration (OSHA):
 - 29 CFR 1910Safety and Health Regulations for General Industry
 - 29 CFR 1926Safety and Health Regulations for Construction Industry
- I. VHA Directive 2005-007

1.2 DEFINITIONS:

- A. Critical Lift. A lift with the hoisted load exceeding 75% of the crane's maximum capacity; lifts made out of the view of the operator (blind picks); lifts involving two or more cranes; personnel being hoisted; and special hazards such as lifts over occupied facilities, loads lifted close to power-lines, and lifts in high winds or where other adverse environmental conditions exist; and any lift which the crane operator believes is critical.
- B. OSHA "Competent Person" (CP). One who is capable of identifying existing and predictable hazards in the surroundings and working conditions which are unsanitary, hazardous or dangerous to employees, and who has the authorization to take prompt corrective measures to eliminate them (see 29 CFR 1926.32(f)).

- C. "Qualified Person" means one who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training and experience, has successfully demonstrated his ability to solve or resolve problems relating to the subject matter, the work, or the project.
- D. High Visibility Accident. Any mishap which may generate publicity or high visibility.
- E. Accident/Incident Criticality Categories:
 - 1. No impact – near miss incidents that should be investigated but are not required to be reported to the VA;
 - 2. Minor incident/impact – incidents that require first aid or result in minor equipment damage (less than \$5000). These incidents must be investigated but are not required to be reported to the VA;
 - 3. Moderate incident/impact – Any work-related injury or illness that results in:
 - a. Days away from work (any time lost after day of injury/illness onset);
 - b. Restricted work;
 - c. Transfer to another job;
 - d. Medical treatment beyond first aid;
 - e. Loss of consciousness;
 - 4. A significant injury or illness diagnosed by a physician or other licensed health care professional, even if it did not result in (1) through (5) above or,
 - 5. Any incident that leads to major equipment damage (greater than \$5000).
- F. These incidents must be investigated and are required to be reported to the VA;
 - 1. Major incident/impact – Any mishap that leads to fatalities, hospitalizations, amputations, and losses of an eye as a result of contractors' activities. Or any

incident which leads to major property damage (greater than \$20,000) and/or may generate publicity or high visibility. These incidents must be investigated and are required to be reported to the VA as soon as practical, but not later than 2 hours after the incident.

- G. Medical Treatment. Treatment administered by a physician or by registered professional personnel under the standing orders of a physician. Medical treatment does not include first aid treatment even though provided by a physician or registered personnel.

1.3 REGULATORY REQUIREMENTS:

- A. In addition to the detailed requirements included in the provisions of this contract, comply with 29 CFR 1926, comply with 29 CFR 1910 as incorporated by reference within 29 CFR 1926, comply with ASSE A10.34, and all applicable federal, state, and local laws, ordinances, criteria, rules and regulations. Submit matters of interpretation of standards for resolution before starting work. Where the requirements of this specification, applicable laws, criteria, ordinances, regulations, and referenced documents vary, the most stringent requirements govern except with specific approval and acceptance by the Project Manager or Contracting Officer Representative.

1.4 ACCIDENT PREVENTION PLAN (APP):

- A. The APP (aka Construction Safety & Health Plan) shall interface with the Contractor's overall safety and health program. Include any portions of the Contractor's overall safety and health program referenced in the APP in the applicable APP element and ensure it is site-specific. The Government considers the Prime Contractor to be the "controlling authority" for all worksite safety and health of each subcontractor(s). Contractors are responsible for informing their subcontractors of the safety provisions under the terms of the contract and the penalties for noncompliance, coordinating the work to prevent one craft from interfering with or creating hazardous working

conditions for other crafts, and inspecting subcontractor operations to ensure that accident prevention responsibilities are being carried out.

B. The APP shall be prepared as follows:

1. Written in English by a qualified person who is employed by the Prime Contractor articulating the specific work and hazards pertaining to the contract (model language can be found in ASSE A10.33). Specifically articulating the safety requirements found within these VA contract safety specifications.
2. Address both the Prime Contractors and the subcontractors work operations.
3. State measures to be taken to control hazards associated with materials, services, or equipment provided by suppliers.
4. Address all the elements/sub-elements and in order as follows:
 - a. **SIGNATURE SHEET.** Title, signature, and phone number of the following:
 - 1) Plan preparer (Qualified Person such as corporate safety staff person or contracted Certified Safety Professional with construction safety experience);
 - 2) Plan approver (company/corporate officers authorized to obligate the company);
 - 3) Plan concurrence (e.g., Chief of Operations, Corporate Chief of Safety, Corporate Industrial Hygienist, project manager or superintendent, project safety professional). Provide concurrence of other applicable corporate and project personnel (Contractor).
 - b. **BACKGROUND INFORMATION.** List the following:
 - 1) Contractor;
 - 2) Contract number;
 - 3) Project name;

- 4) Brief project description, description of work to be performed, and location; phases of work anticipated (these will require an AHA).
- c. **STATEMENT OF SAFETY AND HEALTH POLICY.** Provide a copy of current corporate/company Safety and Health Policy Statement, detailing commitment to providing a safe and healthful workplace for all employees. The Contractor's written safety program goals, objectives, and accident experience goals for this contract should be provided.
- d. **RESPONSIBILITIES AND LINES OF AUTHORITIES.** Provide the following:
- 1) A statement of the employer's ultimate responsibility for the implementation of his SOH program;
 - 2) Identification and accountability of personnel responsible for safety at both corporate and project level. Contracts specifically requiring safety or industrial hygiene personnel shall include a copy of their resumes.
 - 3) The names of Competent and/or Qualified Person(s) and proof of competency/qualification to meet specific OSHA Competent/Qualified Person(s) requirements must be attached.;
 - 4) Requirements that no work shall be performed unless a designated competent person is present on the job site;
 - 5) Requirements for pre-task Activity Hazard Analysis (AHAs);
 - 6) Lines of authority;
 - 7) Policies and procedures regarding noncompliance with safety requirements (to include disciplinary actions for violation of safety requirements) should be identified;
- e. **SUBCONTRACTORS AND SUPPLIERS.** If applicable, provide procedures for coordinating SOH activities with other employers on the job site:

- 1) Identification of subcontractors and suppliers (if known);
- 2) Safety responsibilities of subcontractors and suppliers.

f. TRAINING.

- 1) Site-specific SOH orientation training at the time of initial hire or assignment to the project for every employee before working on the project site is required.
- 2) Mandatory training and certifications that are applicable to this project (e.g., explosive actuated tools, crane operator, rigger, crane signal person, fall protection, electrical lockout/NFPA 70E, machine/equipment lockout, confined space, etc...) and any requirements for periodic retraining/recertification are required.
- 3) Procedures for ongoing safety and health training for supervisors and employees shall be established to address changes in site hazards/conditions.
- 4) OSHA 10-hour training is required for all workers on site and the OSHA 30-hour training is required for Trade Competent Persons (CPs)

g. SAFETY AND HEALTH INSPECTIONS.

- 1) Specific assignment of responsibilities for a minimum daily job site safety and health inspection during periods of work activity: Who will conduct (e.g., "Site Safety and Health CP"), proof of inspector's training/qualifications, when inspections will be conducted, procedures for documentation, deficiency tracking system, and follow-up procedures.
- 2) Any external inspections/certifications that may be required (e.g., contracted CSP or CSHT)

h. ACCIDENT/INCIDENT INVESTIGATION & REPORTING. The Contractor shall conduct mishap investigations of all Moderate and Major as well as all High Visibility Incidents. The APP shall include accident/incident investigation procedure and identify person(s) responsible to provide the following to the Project Manager or Contracting Officer Representative:

- 1) Exposure data (man-hours worked);
- 2) Accident investigation reports;
- 3) Project site injury and illness logs.

i. PLANS (PROGRAMS, PROCEDURES) REQUIRED. Based on a risk assessment of contracted activities and on mandatory OSHA compliance programs, the Contractor shall address all applicable occupational, patient, and public safety risks in site-specific compliance and accident prevention plans. These Plans shall include but are not be limited to procedures for addressing the risks associates with the following:

- 1) Emergency response;
- 2) Contingency for severe weather;
- 3) Fire Prevention;
- 4) Medical Support;
- 5) Posting of emergency telephone numbers;
- 6) Prevention of alcohol and drug abuse;
- 7) Site sanitation(housekeeping, drinking water, toilets);
- 8) Night operations and lighting;
- 9) Hazard communication program;

- 10) Welding/Cutting "Hot" work;
- 11) Electrical Safe Work Practices (Electrical LOTO/NFPA 70E);
- 12) General Electrical Safety;
- 13) Hazardous energy control (Machine LOTO);
- 14) Site-Specific Fall Protection & Prevention;
- 15) Excavation/trenching;
- 16) Asbestos abatement;
- 17) Lead abatement;
- 18) Crane Critical lift;
- 19) Respiratory protection;
- 20) Health hazard control program;
- 21) Radiation Safety Program;
- 22) Abrasive blasting;
- 23) Heat/Cold Stress Monitoring;
- 24) Crystalline Silica Monitoring (Assessment);
- 25) Demolition plan (to include engineering survey);
- 26) Formwork and shoring erection and removal;
- 27) PreCast Concrete;
- 28) Public (Mandatory compliance with ANSI/ASSE A10.34-2012).

- C. Submit the APP to the Project Manager or Contracting Officer Representative or Government Designated Authority for review for compliance with contract requirements in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA

AND SAMPLES 15 calendar days prior to the date of the preconstruction conference for acceptance. Work cannot proceed without an accepted APP.

- D. Once accepted by the Project Manager or Contracting Officer Representative, the APP and attachments will be enforced as part of the contract. Disregarding the provisions of this contract or the accepted APP will be cause for stopping of work, at the discretion of the Contracting Officer in accordance with FAR Clause 52.236-13, *Accident Prevention*, until the matter has been rectified.
- E. Once work begins, changes to the accepted APP shall be made with the knowledge and concurrence of the Project Manager project superintendent, project overall designated OSHA Competent Person, and facility Safety Contracting Officer Representative. Should any severe hazard exposure, i.e. imminent danger, become evident, stop work in the area, secure the area, and develop a plan to remove the exposure and control the hazard. Notify the Contracting Officer within 24 hours of discovery. Eliminate/remove the hazard. In the interim, take all necessary action to restore and maintain safe working conditions in order to safeguard onsite personnel, visitors, the public and the environment.

1.5 ACTIVITY HAZARD ANALYSES (AHAS):

- A. AHAs are also known as Job Hazard Analyses, Job Safety Analyses, and Activity Safety Analyses. Before beginning each work activity involving a type of work presenting hazards not experienced in previous project operations or where a new work crew or sub-contractor is to perform the work, the Contractor(s) performing that work activity shall prepare an AHA (Example electronic AHA forms can be found on the US Army Corps of Engineers web site)
- B. AHAs shall define the activities being performed and identify the work sequences, the specific anticipated hazards, site conditions, equipment, materials, and the control measures to be implemented to eliminate or reduce each hazard to an acceptable level of risk.

- C. Work shall not begin until the AHA for the work activity has been accepted by the Project Manager or Contracting Officer Representative or Government Designated Authority and discussed with all engaged in the activity, including the Contractor, subcontractor(s), and Government on-site representatives at preparatory and initial control phase meetings.
1. The names of the Competent/Qualified Person(s) required for a particular activity (for example, excavations, scaffolding, fall protection, other activities as specified by OSHA and/or other State and Local agencies) shall be identified and included in the AHA. Certification of their competency/qualification shall be submitted to the Government Designated Authority (GDA) for acceptance prior to the start of that work activity.
 2. The AHA shall be reviewed and modified as necessary to address changing site conditions, operations, or change of competent/qualified person(s).
 - a. If more than one Competent/Qualified Person is used on the AHA activity, a list of names shall be submitted as an attachment to the AHA. Those listed must be Competent/Qualified for the type of work involved in the AHA and familiar with current site safety issues.
 - b. If a new Competent/Qualified Person (not on the original list) is added, the list shall be updated (an administrative action not requiring an updated AHA). The new person shall acknowledge in writing that he or she has reviewed the AHA and is familiar with current site safety issues.
 3. Submit AHAs to the Project Manager or Contracting Officer Representative or Government Designated Authority for review for compliance with contract requirements in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES for review at least 15 calendar days prior to the start of each phase. Subsequent AHAs as shall be formatted as amendments to the APP. The

analysis should be used during daily inspections to ensure the implementation and effectiveness of the activity's safety and health controls.

4. The AHA list will be reviewed periodically (at least monthly) at the Contractor supervisory safety meeting and updated as necessary when procedures, scheduling, or hazards change.
5. Develop the activity hazard analyses using the project schedule as the basis for the activities performed. All activities listed on the project schedule will require an AHA. The AHAs will be developed by the contractor, supplier, or subcontractor and provided to the prime contractor for review and approval and then submitted to the Project Manager or Contracting Officer Representative

1.6 PRECONSTRUCTION CONFERENCE:

- A. Contractor representatives who have a responsibility or significant role in implementation of the accident prevention program, as required by 29 CFR 1926.20(b)(1), on the project shall attend the preconstruction conference to gain a mutual understanding of its implementation. This includes the project superintendent, subcontractor superintendents, and any other assigned safety and health professionals.
- B. Discuss the details of the submitted APP to include incorporated plans, programs, procedures and a listing of anticipated AHAs that will be developed and implemented during the performance of the contract. This list of proposed AHAs will be reviewed at the conference and an agreement will be reached between the Contractor and the Contracting Officer's representative as to which phases will require an analysis. In addition, establish a schedule for the preparation, submittal, review, and acceptance of AHAs to preclude project delays.
- C. Deficiencies in the submitted APP will be brought to the attention of the Contractor within 14 days of submittal, and the Contractor shall revise the plan to correct deficiencies and re-submit it for acceptance. Do not begin work until there is an accepted APP.

1.7 “SITE SAFETY AND HEALTH OFFICER” (SSHO) AND “COMPETENT PERSON” (CP):

- A. The Prime Contractor shall designate a minimum of one SSHO at each project site that will be identified as the SSHO to administer the Contractor's safety program and government-accepted Accident Prevention Plan. Each subcontractor shall designate a minimum of one CP in compliance with 29 CFR 1926.20 (b)(2) that will be identified as a CP to administer their individual safety programs.
- B. Further, all specialized Competent Persons for the work crews will be supplied by the respective contractor as required by 29 CFR 1926 (i.e. Asbestos, Electrical, Cranes, & Derricks, Demolition, Fall Protection, Fire Safety/Life Safety, Ladder, Rigging, Scaffolds, and Trenches/Excavations).
- C. These Competent Persons can have collateral duties as the subcontractor's superintendent and/or work crew lead persons as well as fill more than one specialized CP role (i.e. Asbestos, Electrical, Cranes, & Derricks, Demolition, Fall Protection, Fire Safety/Life Safety, Ladder, Rigging, Scaffolds, and Trenches/Excavations). However, the SSHO has be a separate qualified individual from the Prime Contractor's Superintendent and/or Quality Control Manager with duties only as the SSHO
- D. The SSHO or an equally-qualified Designated Representative/alternate will maintain a presence on the site during construction operations in accordance with FAR Clause 52.236-6: *Superintendence by the Contractor*. CPs will maintain presence during their construction activities in accordance with above mentioned clause. A listing of the designated SSHO and all known CPs shall be submitted prior to the start of work as part of the APP with the training documentation and/or AHA as listed in Section 1.8 below.
- E. The repeated presence of uncontrolled hazards during a contractor's work operations will result in the designated CP as being deemed incompetent and result in the required removal of the employee in accordance with FAR Clause 52.236-5: Material and Workmanship, Paragraph (c).

1.8 TRAINING:

- A. The designated Prime Contractor SSHO must meet the requirements of all applicable OSHA standards and be capable (through training, experience, and qualifications) of ensuring that the requirements of 29 CFR 1926.16 and other appropriate Federal, State and local requirements are met for the project. As a minimum the SSHO must have completed the OSHA 30-hour Construction Safety class and have five (5) years of construction industry safety experience or three (3) years if he/she possesses a Certified Safety Professional (CSP) or certified Construction Safety and Health Technician (CSHT) certification or have a safety and health degree from an accredited university or college.
- B. All designated CPs shall have completed the OSHA 30-hour Construction Safety course within the past 5 years.
- C. In addition to the OSHA 30 Hour Construction Safety Course, all CPs with high hazard work operations such as operations involving asbestos, electrical, cranes, demolition, work at heights/fall protection, fire safety/life safety, ladder, rigging, scaffolds, and trenches/excavations shall have a specialized formal course in the hazard recognition & control associated with those high hazard work operations. Documented "repeat" deficiencies in the execution of safety requirements will require retaking the requisite formal course.
- D. All other construction workers shall have the OSHA 10-hour Construction Safety Outreach course and any necessary safety training to be able to identify hazards within their work environment.
- E. Submit training records associated with the above training requirements to the Project Manager or Contracting Officer Representative or Government Designated Authority for review for compliance with contract requirements in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES 15 calendar days prior to the date of the preconstruction conference for acceptance.

- F. Prior to any worker for the contractor or subcontractors beginning work, they shall undergo a safety briefing provided by the SSHO or his/her designated representative. As a minimum, this briefing shall include information on the site-specific hazards, construction limits, VAMC safety guidelines, means of egress, break areas, work hours, locations of restrooms, use of VAMC equipment, emergency procedures, accident reporting etc... Documentation shall be provided to the Resident Engineer that individuals have undergone contractor's safety briefing.
- G. Ongoing safety training will be accomplished in the form of weekly documented safety meeting.

1.9 INSPECTIONS:

- A. The SSHO shall conduct frequent and regular safety inspections (daily) of the site and each of the subcontractors CPs shall conduct frequent and regular safety inspections (daily) of the their work operations as required by 29 CFR 1926.20(b)(2). Each week, the SSHO shall conduct a formal documented inspection of the entire construction areas with the subcontractors' "Trade Safety and Health CPs" present in their work areas. Coordinate with, and report findings and corrective actions weekly to Project Manager or Contracting Officer Representative .
- B. A Certified Safety Professional (CSP) with specialized knowledge in construction safety or a certified Construction Safety and Health Technician (CSHT) shall randomly conduct a monthly site safety inspection. The CSP or CSHT can be a corporate safety professional or independently contracted. The CSP or CSHT will provide their certificate number on the required report for verification as necessary.
 - 1. Results of the inspection will be documented with tracking of the identified hazards to abatement.
 - 2. The Project Manager or Contracting Officer Representative or Government Designated Authority will be notified immediately prior to start of the inspection and invited to accompany the inspection.

3. Identified hazard and controls will be discussed to come to a mutual understanding to ensure abatement and prevent future reoccurrence.
4. A report of the inspection findings with status of abatement will be provided to the Project Manager or Contracting Officer Representative or Government Designated Authority within one week of the onsite inspection.

1.10 ACCIDENTS, OSHA 300 LOGS, AND MAN-HOURS:

- A. The prime contractor shall establish and maintain an accident reporting, recordkeeping, and analysis system to track and analyze all injuries and illnesses, high visibility incidents, and accidental property damage (both government and contractor) that occur on site. Notify the Project or Contracting Officer Representative or Government Designated Authority as soon as practical, but no more than four hours after any accident meeting the definition of a Moderate or Major incidents, High Visibility Incidents, , or any weight handling and hoisting equipment accident. Within notification include contractor name; contract title; type of contract; name of activity, installation or location where accident occurred; date and time of accident; names of personnel injured; extent of property damage, if any; extent of injury, if known, and brief description of accident (to include type of construction equipment used, PPE used, etc.). Preserve the conditions and evidence on the accident site until the Project Manager or Contracting Officer Representative or Government Designated Authority determine whether a government investigation will be conducted.
- B. Conduct an accident investigation for all Minor, Moderate and Major incidents as defined in paragraph DEFINITIONS, and property damage accidents resulting in at least \$20,000 in damages, to establish the root cause(s) of the accident. Complete the VA Form 2162 (or equivalent) , and provide the report to the Project Manager or Contracting Officer Representative or Government Designated Authority within 5 calendar days of the accident. The Project Manager or Contracting Officer

Representative or Government Designated Authority will provide copies of any required or special forms.

- C. A summation of all man-hours worked by the contractor and associated sub-contractors for each month will be reported to the Project Manager or Contracting Officer Representative or Government Designated Authority monthly.
- D. A summation of all Minor, Moderate, and Major incidents experienced on site by the contractor and associated sub-contractors for each month will be provided to the Project or Contracting Officer Representative or Government Designated Authority monthly. The contractor and associated sub-contractors' OSHA 300 logs will be made available to the Project Manager or Contracting Officer Representative or Government Designated Authority as requested.

1.11 PERSONAL PROTECTIVE EQUIPMENT (PPE):

- A. PPE is governed in all areas by the nature of the work the employee is performing. For example, specific PPE required for performing work on electrical equipment is identified in NFPA 70E, Standard for Electrical Safety in the Workplace.
- B. Mandatory PPE includes:
 - 1. Hard Hats – unless written authorization is given by Project Manager or Contracting Officer Representative or Government Designated Authority in circumstances of work operations that have limited potential for falling object hazards such as during finishing work or minor remodeling. With authorization to relax the requirement of hard hats, if a worker becomes exposed to an overhead falling object hazard, then hard hats would be required in accordance with the OSHA regulations.
 - 2. Safety glasses - unless written authorization is given by the Project Manager or Contracting Officer Representative or Government Designated Authority in circumstances of no eye hazards, appropriate safety glasses meeting the ANSI Z.87.1 standard must be worn by each person on site.

3. Appropriate Safety Shoes – based on the hazards present, safety shoes meeting the requirements of ASTM F2413-11 shall be worn by each person on site unless written authorization is given by the Project Manager or Contracting Officer Representative or Government Designated Authority in circumstances of no foot hazards.
4. Hearing protection - Use personal hearing protection at all times in designated noise hazardous areas or when performing noise hazardous tasks.

1.12 INFECTION CONTROL

- A. Infection Control is critical in all medical center facilities. Interior construction activities causing disturbance of existing dust, or creating new dust, must be conducted within ventilation-controlled areas that minimize the flow of airborne particles into patient areas. Exterior construction activities causing disturbance of soil or creates dust in some other manner must be controlled.
- B. An AHA associated with infection control will be performed by VA personnel in accordance with FGI Guidelines (i.e. Infection Control Risk Assessment (ICRA)). The ICRA procedure found on the American Society for Healthcare Engineering (ASHE) website will be utilized. Risk classifications of Class II or lower will require approval by the Contracting Officer Representative or Government Designated Authority before beginning any construction work. Risk classifications of Class III or higher will require a permit before beginning any construction work. Infection Control permits will be issued by the Project Engineer. The Infection Control Permits will be posted outside the appropriate construction area. More than one permit may be issued for a construction project if the work is located in separate areas requiring separate classes. The primary project scope area for this project is: **Class 1**, however, work outside the primary project scope area may vary. The required infection control precautions with each class are as follows:

1. Class I requirements:
 - a. During Construction Work:

- 1) Notify the Contracting Officer Representative
 - 2) Execute work by methods to minimize raising dust from construction operations.
 - 3) Ceiling tiles: Immediately replace a ceiling tiles displaced for visual inspection.
- b. Upon Completion:
- 1) Clean work area upon completion of task
 - 2) Notify the Contracting Officer Representative
2. Class II requirements:
- a. During Construction Work:
- 1) Notify the Contracting Officer Representative
 - 2) Provide active means to prevent airborne dust from dispersing into atmosphere such as wet methods or tool mounted dust collectors where possible.
 - 3) Water mist work surfaces to control dust while cutting.
 - 4) Seal unused doors with duct tape.
 - 5) Block off and seal air vents.
 - 6) Remove or isolate HVAC system in areas where work is being performed.
- b. Upon Completion:
- 1) Wipe work surfaces with cleaner/disinfectant.
 - 2) Contain construction waste before transport in tightly covered containers.

- 3) Wet mop and/or vacuum with HEPA filtered vacuum before leaving work area.
 - 4) Upon completion, restore HVAC system where work was performed
 - 5) Notify the Contracting Officer Representative =
3. Class III requirements:
- a. During Construction Work:
 - 1) Obtain permit from the Contracting Officer Representative or Government Designated Authority
 - 2) Remove or Isolate HVAC system in area where work is being done to prevent contamination of duct system.
 - 3) Complete all critical barriers i.e. sheetrock, plywood, plastic, to seal area from non-work area or implement control cube method (cart with plastic covering and sealed connection to work site with HEPA vacuum for vacuuming prior to exit) before construction begins. Install construction barriers and ceiling protection carefully, outside of normal work hours.
 - 4) Maintain negative air pressure, 0.01 inches of water gauge, within work site utilizing HEPA equipped air filtration units and continuously monitored with a digital display, recording and alarm instrument, which must be calibrated on installation, maintained with periodic calibration and monitored by the contractor.
 - 5) Contain construction waste before transport in tightly covered containers.
 - 6) Cover transport receptacles or carts. Tape covering unless solid lid.
 - b. Upon Completion:

- 1) Do not remove barriers from work area until completed project is inspected by the Contracting Officer Representative or Government Designated Authority and thoroughly cleaned by the VA Environmental Services Department.
 - 2) Remove construction barriers and ceiling protection carefully to minimize spreading of dirt and debris associated with construction, outside of normal work hours.
 - 3) Vacuum work area with HEPA filtered vacuums.
 - 4) Wet mop area with cleaner/disinfectant.
 - 5) Upon completion, restore HVAC system where work was performed.
 - 6) Return permit to the Contracting Officer Representative or Government Designated Authority
4. Class IV requirements:
- a. During Construction Work:
 - 1) Obtain permit from the Contracting Officer Representative or Government Designated Authority
 - 2) Isolate HVAC system in area where work is being done to prevent contamination of duct system.
 - 3) Complete all critical barriers i.e. sheetrock, plywood, plastic, to seal area from non work area or implement control cube method (cart with plastic covering and sealed connection to work site with HEPA vacuum for vacuuming prior to exit) before construction begins. Install construction barriers and ceiling protection carefully, outside of normal work hours.
 - 4) Maintain negative air pressure, 0.01 inches of water gauge, within work site utilizing HEPA equipped air filtration units and continuously monitored with a

digital display, recording and alarm instrument, which must be calibrated on installation, maintained with periodic calibration and monitored by the contractor.5) Seal holes, pipes, conduits, and punctures.

- 6) Construct anteroom and require all personnel to pass through this room so they can be vacuumed using a HEPA vacuum cleaner before leaving work site or they can wear cloth or paper coveralls that are removed each time they leave work site.
- 7) All personnel entering work site are required to wear shoe covers. Shoe covers must be changed each time the worker exits the work area.

b. Upon Completion:

- 1) Do not remove barriers from work area until completed project is inspected by the Contracting Officer Representative or Government Designated Authority with thorough cleaning by the VA Environmental Services Dept.
- 2) Remove construction barriers and ceiling protection carefully to minimize spreading of dirt and debris associated with construction, outside of normal work hours.
- 3) Contain construction waste before transport in tightly covered containers.
- 4) Cover transport receptacles or carts. Tape covering unless solid lid.
- 5) Vacuum work area with HEPA filtered vacuums.
- 6) Wet mop area with cleaner/disinfectant.
- 7) Upon completion, restore HVAC system where work was performed.
- 8) Return permit to the Contracting Officer Representative

C. Barriers shall be erected as required based upon classification (Class III & IV requires barriers) and shall be constructed as follows:

1. Class III and IV - closed door with masking tape applied over the frame and door is acceptable for projects that can be contained in a single room.
2. Construction, demolition or reconstruction not capable of containment within a single room must have the following barriers erected and made presentable on hospital occupied side:
 - a. Class III & IV (where dust control is the only hazard, and an agreement is reached with the Resident Engineer and Medical Center) - Airtight plastic barrier that extends from the floor to ceiling. Seams must be sealed with duct tape to prevent dust and debris from escaping
 - b. Class III & IV - Drywall barrier erected with joints covered or sealed to prevent dust and debris from escaping.
 - c. Class III & IV - Seal all penetrations in existing barrier airtight
 - d. Class III & IV - Barriers at penetration of ceiling envelopes, chases and ceiling spaces to stop movement air and debris
 - e. Class IV only - Anteroom or double entrance openings that allow workers to remove protective clothing or vacuum off existing clothing
 - f. Class III & IV - At elevators shafts or stairways within the field of construction, overlapping flap minimum of two feet wide of polyethylene enclosures for personnel access.

D. Products and Materials:

1. Sheet Plastic: Fire retardant polystyrene, 6-mil thickness meeting local fire codes
2. Barrier Doors: Self Closing One-hour fire-rated solid core wood in steel frame, painted
3. Dust proof one-hour fire-rated drywall

4. High Efficiency Particulate Air-Equipped filtration machine rated at 95% capture of 0.3 microns including pollen, mold spores and dust particles. HEPA filters should have ASHRAE 85 or other prefilter to extend the useful life of the HEPA. Provide both primary and secondary filtrations units. Maintenance of equipment and replacement of the HEPA filters and other filters will be in accordance with manufacturer's instructions.
 5. Exhaust Hoses: Heavy duty, flexible steel reinforced; Ventilation Blower Hose
 6. Adhesive Walk-off Mats: Provide minimum size mats of 24 inches x 36 inches
 7. Disinfectant: Hospital-approved disinfectant or equivalent product
 8. Portable Ceiling Access Module
- E. Before any construction on site begins, all contractor personnel involved in the construction or renovation activity shall be educated and trained in infection prevention measures established by the medical center.
- F. A dust control program will be established and maintained as part of the contractor's infection preventive measures in accordance with the FGI Guidelines for Design and Construction of Healthcare Facilities. Prior to start of work, prepare a plan detailing project-specific dust protection measures with associated product data, including periodic status reports, and submit to Engineer and Facility CSC for review for compliance with contract requirements in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.
- G. Medical center Infection Control personnel will monitor for airborne disease (e.g. aspergillosis) during construction. A baseline of conditions will be established by the medical center prior to the start of work and periodically during the construction stage to determine impact of construction activities on indoor air quality with safe thresholds established.

H. In general, the following preventive measures shall be adopted during construction to keep down dust and prevent mold.

1. Contractor shall verify that construction exhaust to exterior is not reintroduced to the medical center through intake vents, or building openings. HEPA filtration is required where the exhaust dust may reenter the medical center.
2. Exhaust hoses shall be exhausted so that dust is not reintroduced to the medical center.
3. Adhesive Walk-off/Carpet Walk-off Mats shall be used at all interior transitions from the construction area to occupied medical center area. These mats shall be changed as often as required to maintain clean work areas directly outside construction area at all times.
4. Vacuum and wet mop all transition areas from construction to the occupied medical center at the end of each workday. Vacuum shall utilize HEPA filtration. Maintain surrounding area frequently. Remove debris as it is created. Transport these outside the construction area in containers with tightly fitting lids.
5. The contractor shall not haul debris through patient-care areas without prior approval of the Resident Engineer and the Medical Center. When, approved, debris shall be hauled in enclosed dust proof containers or wrapped in plastic and sealed with duct tape. No sharp objects should be allowed to cut through the plastic. Wipe down the exterior of the containers with a damp rag to remove dust. All equipment, tools, material, etc. transported through occupied areas shall be made free from dust and moisture by vacuuming and wipe down.
6. There shall be no standing water during construction. This includes water in equipment drip pans and open containers within the construction areas. All accidental spills must be cleaned up and dried within 12 hours. Remove and dispose of porous materials that remain damp for more than 72 hours.

7. At completion, remove construction barriers and ceiling protection carefully, outside of normal work hours. Vacuum and clean all surfaces free of dust after the removal.

I. Final Cleanup:

1. Upon completion of project, or as work progresses, remove all construction debris from above ceiling, vertical shafts and utility chases that have been part of the construction.
2. Perform HEPA vacuum cleaning of all surfaces in the construction area. This includes walls, ceilings, cabinets, furniture (built-in or free standing), partitions, flooring, etc.
3. All new air ducts shall be cleaned prior to final inspection.

J. Exterior Construction

1. Contractor shall verify that dust will not be introduced into the medical center through intake vents, or building openings. HEPA filtration on intake vents is required where dust may be introduced.
2. Dust created from disturbance of soil such as from vehicle movement will be wetted with use of a water truck as necessary
3. All cutting, drilling, grinding, sanding, or disturbance of materials shall be accomplished with tools equipped with either local exhaust ventilation (i.e. vacuum systems) or wet suppression controls.

1.13 TUBERCULOSIS SCREENING

- A. Contractor shall provide written certification that all contract employees assigned to the work site have had a pre-placement tuberculin screening within 90 days prior to assignment to the worksite and been found have negative TB screening reactions. Contractors shall be required to show documentation of negative TB screening reactions for any additional workers who are added after the 90-day requirement before they will

be allowed to work on the work site. NOTE: This can be the Center for Disease Control (CDC) and Prevention and two-step skin testing or a Food and Drug Administration (FDA)-approved blood test.

1. Contract employees manifesting positive screening reactions to the tuberculin shall be examined according to current CDC guidelines prior to working on VHA property.
2. Subsequently, if the employee is found without evidence of active (infectious) pulmonary TB, a statement documenting examination by a physician shall be on file with the employer (construction contractor), noting that the employee with a positive tuberculin screening test is without evidence of active (infectious) pulmonary TB.
3. If the employee is found with evidence of active (infectious) pulmonary TB, the employee shall require treatment with a subsequent statement to the fact on file with the employer before being allowed to return to work on VHA property.

1.14 FIRE SAFETY

- A. Fire Safety Plan: Establish and maintain a site-specific fire protection program in accordance with 29 CFR 1926. Prior to start of work, prepare a plan detailing project-specific fire safety measures, including periodic status reports, and submit to Contracting Officer Representative or Government Designated Authority for review for compliance with contract requirements in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES. This plan may be an element of the Accident Prevention Plan. Contractor is to perform weekly fire hazard and OSHA safety inspections of the entire construction area from the time construction starts until the building is turned over to the government. A copy of these reports, listing all hazards identified and corrective actions taken, is to be provided weekly to the Resident Engineer.

- B. Site and Building Access: Maintain free and unobstructed access to facility emergency services and for fire, police and other emergency response forces in accordance with NFPA 241.
- C. Separate temporary facilities, such as trailers, storage sheds, and dumpsters, from existing buildings and new construction by distances in accordance with NFPA 241. For small facilities with less than 20 feet exposing overall length, separate by 10 feet.
- D. Temporary Construction Partitions: Close all openings in smoke barriers and fire-rated construction (walls, floors, and ceilings) to maintain fire ratings. This includes any existing holes as well as contractor caused holes. Holes are to be sealed as soon as possible and as a minimum by the end of each workday with temporary or permanent fire sealant. Seal penetrations with listed through-penetration fire stop materials in accordance with Section 07 84 00, FIRESTOPPING.
- E. Temporary Heating and Electrical: Install, use and maintain installations in accordance with 29 CFR 1926, NFPA 241 and NFPA 70.
- F. Means of Egress: Do not block exiting for occupied buildings, including paths from exits to roads. Minimize disruptions and coordinate with Contracting Officer Representative
- G. Egress Routes for Construction Workers: Maintain free and unobstructed egress. Inspect daily. Report findings and corrective actions weekly to Contracting Officer Representative
- H. Fire Extinguishers: Provide and maintain extinguishers in construction areas and temporary storage areas in accordance with 29 CFR 1926, NFPA 241 and NFPA 10.
- I. Flammable and Combustible Liquids: Store, dispense and use liquids in accordance with 29 CFR 1926, NFPA 241 and NFPA 30.
- J. Standpipes: Install and extend standpipes up with each floor in accordance with 29 CFR 1926 and NFPA 241. Do not charge wet standpipes subject to freezing until weather protected.

- M. Smoke Detectors: Prevent accidental operation. Remove temporary covers at end of work operations each day. Coordinate with Contracting Officer Representative
- N. Hot Work: Perform and safeguard hot work operations in accordance with NFPA 241 and NFPA 51B. Coordinate with Facility Safety Office. Designate contractor's responsible project-site fire prevention program manager to permit hot work.
- O. Fire Hazard Prevention and Safety Inspections: Inspect entire construction areas weekly. Coordinate with, and report findings and corrective actions weekly to Contracting Officer Representative.
- P. Smoking: Smoking is prohibited in and adjacent to construction areas, inside existing buildings, on building roofs, in crawl spaces, etc. In separate and detached buildings under construction, smoking is prohibited except in VA designated smoking areas. This includes the use of electronic cigarettes and any sort of "vaping."
- Q. Dispose of waste and debris in accordance with NFPA 241. Remove from buildings daily.
- R. If required, submit documentation to COR or other Government Designated Authority that personnel have been trained in the fire safety aspects of working in areas with impaired structural or compartmentalization features.
- S. See Attachment A at the end of the section for sample of hot work permit.

1.15 ELECTRICAL

- A. All electrical work shall comply with NFPA 70 (NEC), NFPA 70B, NFPA 70E, 29 CFR Part 1910 Subpart J – General Environmental Controls, 29 CFR Part 1910 Subpart S – Electrical, and 29 CFR 1926 Subpart K in addition to other references required by contract.
- B. All qualified persons performing electrical work under this contract shall be licensed journeyman or master electricians. All apprentice electricians performing under this contract shall be deemed unqualified persons unless they are working under the immediate supervision of a licensed electrician or master electrician.

- C. All electrical work will be accomplished de-energized and in the Electrically Safe Work Condition (refer to NFPA 70E for Work Involving Electrical Hazards, including Exemptions to Work Permit). Any Contractor, subcontractor or temporary worker who fails to fully comply with this requirement is subject to immediate termination in accordance with FAR clause 52.236-5(c). Only in rare circumstance where achieving an electrically safe work condition prior to beginning work would increase or cause additional hazards, or is infeasible due to equipment design or operational limitations is energized work permitted. The Contracting Officer Representative or Government Designated Authority with approval of the Medical Center Director will make the determination if the circumstances would meet the exception outlined above. An AHA and permit specific to energized work activities will be developed, reviewed, and accepted by the VA prior to the start of that activity.
1. Development of a Hazardous Electrical Energy Control Procedure is required prior to de-energization. A single Simple Lockout/Tagout Procedure for multiple work operations can only be used for work involving qualified person(s) de-energizing one set of conductors or circuit part source. Task specific Complex Lockout/Tagout Procedures are required at all other times.
 2. Verification of the absence of voltage after de-energization and lockout/tagout is considered "energized electrical work" (live work) under NFPA 70E, and shall only be performed by qualified persons wearing appropriate shock protective (voltage rated) gloves and arc rate personal protective clothing and equipment, using Underwriters Laboratories (UL) tested and appropriately rated contact electrical testing instruments or equipment appropriate for the environment in which they will be used.
 3. Personal Protective Equipment (PPE) and electrical testing instruments will be readily available for inspection by the Contracting Officer Representative

- D. Before beginning any electrical work, an Activity Hazard Analysis (AHA) will be conducted to include Shock Hazard and Arc Flash Hazard analyses (NFPA Tables can be used only as a last alternative and it is strongly suggested a full Arc Flash Hazard Analyses be conducted). Work shall not begin until the AHA for the work activity and permit for energized work has been reviewed and accepted by the Contracting Officer Representative and discussed with all engaged in the activity, including the Contractor, subcontractor(s), and Government on-site representatives at preparatory and initial control phase meetings.
- E. Ground-fault circuit interrupters. GFCI protection shall be provided where an employee is operating or using cord- and plug-connected tools related to construction activity supplied by 125-volt, 15-, 20-, or 30- ampere circuits. Where employees operate or use equipment supplied by greater than 125-volt, 15-, 20-, or 30- ampere circuits, GFCI protection or an assured equipment grounding conductor program shall be implemented in accordance with NFPA 70E - 2015, Chapter 1, Article 110.4(C)(2)..

1.16 FALL PROTECTION

- A. The fall protection (FP) threshold height requirement is 6 ft for ALL WORK, unless specified differently or the OSHA 29 CFR 1926 requirements are more stringent, to include steel erection activities, systems-engineered activities (prefabricated) metal buildings, residential (wood) construction and scaffolding work.
1. The use of a Safety Monitoring System (SMS) as a fall protection method is prohibited.
 2. The use of Controlled Access Zone (CAZ) as a fall protection method is prohibited.
 3. A Warning Line System (WLS) may ONLY be used on floors or flat or low-sloped roofs (between 0 - 18.4 degrees or 4:12 slope) and shall be erected around all sides of the work area (See 29 CFR 1926.502(f) for construction of WLS requirements). Working within the WLS does not require FP. No worker shall be allowed in the area between

the roof or floor edge and the WLS without FP. FP is required when working outside the WLS.

4. Fall protection while using a ladder will be governed by the OSHA requirements.

1.17 SCAFFOLDS AND OTHER WORK PLATFORMS

- A. All scaffolds and other work platforms construction activities shall comply with 29 CFR 1926 Subpart L.
- B. The fall protection (FP) threshold height requirement is 6 ft as stated in Section 1.16.
- C. The following hierarchy and prohibitions shall be followed in selecting appropriate work platforms.
 1. Scaffolds, platforms, or temporary floors shall be provided for all work except that can be performed safely from the ground or similar footing.
 2. Ladders less than 20 feet may be used as work platforms only when use of small hand tools or handling of light material is involved.
 3. Ladder jacks, lean-to, and prop-scaffolds are prohibited.
 4. Emergency descent devices shall not be used as working platforms.
- D. Contractors shall use a scaffold tagging system in which all scaffolds are tagged by the Competent Person. Tags shall be color-coded: green indicates the scaffold has been inspected and is safe to use; red indicates the scaffold is unsafe to use. Tags shall be readily visible, made of materials that will withstand the environment in which they are used, be legible and shall include:
 1. The Competent Person's name and signature;
 2. Dates of initial and last inspections.
- E. Mast Climbing work platforms: When access ladders, including masts designed as ladders, exceed 20 ft in height, positive fall protection shall be used.

1.18 EXCAVATION AND TRENCHES

- A. All excavation and trenching work shall comply with 29 CFR 1926 Subpart P. Excavations less than 5 feet in depth require evaluation by the contractor's "Competent Person" (CP) for determination of the necessity of an excavation protective system where kneeling, laying in, or stooping within the excavation is required.
- B. All excavations and trenches 24 inches in depth or greater shall require a written trenching and excavation permit (NOTE – some States and other local jurisdictions require separate state/jurisdiction-issued excavation permits). The permit shall have two sections, one section will be completed prior to digging or drilling and the other will be completed prior to personnel entering the excavations greater than 5 feet in depth. Each section of the permit shall be provided to the Officer prior to proceeding with digging or drilling and prior to proceeding with entering the excavation. After completion of the work and prior to opening a new section of an excavation, the permit shall be closed out and provided to the Officer. The permit shall be maintained onsite and the first section of the permit shall include the following:
 - 1. Estimated start time & stop time
 - 2. Specific location and nature of the work.
 - 3. Indication of the contractor's "Competent Person" (CP) in excavation safety with qualifications and signature. Formal course in excavation safety is required by the contractor's CP.
 - 4. Indication of whether soil or concrete removal to an offsite location is necessary.
 - 5. Indication of whether soil samples are required to determined soil contamination.
 - 6. Indication of coordination with local authority (i.e. "One Call") or contractor's effort to determine utility location with search and survey equipment.
 - 7. Indication of review of site drawings for proximity of utilities to digging/drilling.

C. The second section of the permit for excavations greater than five feet in depth shall include the following:

1. Determination of OSHA classification of soil. Soil samples will be from freshly dug soil with samples taken from different soil type layers as necessary and placed at a safe distance from the excavation by the excavating equipment. A pocket penetrometer will be utilized in determination of the unconfined compression strength of the soil for comparison against OSHA table (Less than 0.5 Tons/FT² – Type C, 0.5 Tons/FT² to 1.5 Tons/FT² – Type B, greater than 1.5 Tons/FT² – Type A without condition to reduce to Type B).
2. Indication of selected protective system (sloping/benching, shoring, shielding). When soil classification is identified as “Type A” or “Solid Rock”, only shoring or shielding or Professional Engineer designed systems can be used for protection. A Sloping/Benching system may only be used when classifying the soil as Type B or Type C. Refer to Appendix B of 29 CFR 1926, Subpart P for further information on protective systems designs.
3. Indication of the spoil pile being stored at least 2 feet from the edge of the excavation and safe access being provided within 25 feet of the workers.
4. Indication of assessment for a potential toxic, explosive, or oxygen deficient atmosphere where oxygen deficiency (atmospheres containing less than 19.5 percent oxygen) or a hazardous atmosphere exists or could reasonably be expected to exist. Internal combustion engine equipment is not allowed in an excavation without providing force air ventilation to lower the concentration to below OSHA PELs, providing sufficient oxygen levels, and atmospheric testing as necessary to ensure safe levels are maintained.

D As required by OSHA 29 CFR 1926.651(b)(1), the estimated location of utility installations, such as sewer, telephone, fuel, electric, water lines, or any other

underground installations that reasonably may be expected to be encountered during excavation work, shall be determined prior to opening an excavation.

1. The planned dig site will be outlined/marked in white prior to locating the utilities.
 2. Used of the American Public Works Association Uniform Color Code is required for the marking of the proposed excavation and located utilities.
 3. 811 will be called two business days before digging on all local or State lands and public Right-of Ways.
 4. Digging will not commence until all known utilities are marked.
 5. Utility markings will be maintained
- E. Excavations will be hand dug or excavated by other similar safe and acceptable means as excavation operations approach within 3 to 5 feet of identified underground utilities. Exploratory bar or other detection equipment will be utilized as necessary to further identify the location of underground utilities.
- F. Excavations greater than 20 feet in depth require a Professional Engineer designed excavation protective system.

1.19 CRANES

- A. All crane work shall comply with 29 CFR 1926 Subpart CC.
- B. Prior to operating a crane, the operator must be licensed, qualified or certified to operate the crane. Thus, all the provisions contained with Subpart CC are effective and there is no "Phase In" date.
- C. A detailed lift plan for all lifts shall be submitted to the Government Designated Authority 14 days prior to the scheduled lift complete with route for truck carrying load, crane load analysis, siting of crane and path of swing and all other elements of a critical lift plan where the lift meets the definition of a critical lift. Critical lifts require a more comprehensive lift plan to minimize the potential of crane failure and/or catastrophic

loss. The plan must be reviewed and accepted by the General Contractor before being submitted to the VA for review. The lift will not be allowed to proceed without prior acceptance of this document.

D. Crane operators shall not carry loads

1. over the general public or VAMC personnel
2. over any occupied building unless
 - a. the top two floors are vacated
 - b. or overhead protection with a design live load of 300 psf is provided

1.20 CONTROL OF HAZARDOUS ENERGY (LOCKOUT/TAGOUT)

- A. All installation, maintenance, and servicing of equipment or machinery shall comply with 29 CFR 1910.147 except for specifically referenced operations in 29 CFR 1926 such as concrete & masonry equipment [1926.702(j)], heavy machinery & equipment [1926.600(a)(3)(i)], and process safety management of highly hazardous chemicals (1926.64). Control of hazardous electrical energy during the installation, maintenance, or servicing of electrical equipment shall comply with Section 1.15 to include NFPA 70E and other VA specific requirements discussed in the section.

1.21 CONFINED SPACE ENTRY

- A. All confined space entry shall comply with 29 CFR 1926, Subpart AA except for specifically referenced operations in 29 CFR 1926 such as excavations/trenches [1926.651(g)].
- B. A site-specific Confined Space Entry Plan (including permitting process) shall be developed and submitted to the Facility Safety Officer and/or other Government Designated Authority.

1.22 WELDING AND CUTTING

As specified in section 1.14, Hot Work: Perform and safeguard hot work operations in accordance with NFPA 241 and NFPA 51B. Coordinate with Facility Safety Officer and/or other Government Designated Authority. Obtain permits from Facility Safety Officer and/or other Government Designated Authority at least ____ hours in advance .

Designate contractor's responsible project-site fire prevention program manager to permit hot work.

1.23 LADDERS

- A. All Ladder use shall comply with 29 CFR 1926 Subpart X.
- B. All portable ladders shall be of sufficient length and shall be placed so that workers will not stretch or assume a hazardous position.
- C. Manufacturer safety labels shall be in place on ladders
- D. Step Ladders shall not be used in the closed position
- E. Top steps or cap of step ladders shall not be used as a step
- F. Portable ladders, used as temporary access, shall extend at least 3 ft above the upper landing surface.
 - 1. When a 3 ft extension is not possible, a grasping device (such as a grab rail) shall be provided to assist workers in mounting and dismounting the ladder.
 - 2. In no case shall the length of the ladder be such that ladder deflection under a load would, by itself, cause the ladder to slip from its support.
- G. Ladders shall be inspected for visible defects on a daily basis and after any occurrence that could affect their safe use. Broken or damaged ladders shall be immediately tagged "DO NOT USE," or with similar wording, and withdrawn from service until restored to a condition meeting their original design.

1.24 FLOOR & WALL OPENINGS

- A. All floor and wall openings shall comply with 29 CFR 1926 Subpart M.
- B. Floor and roof holes/openings are any that measure over 2 in. in any direction of a walking/working surface which persons may trip or fall into or where objects may fall to the level below. Skylights located in floors or roofs are considered floor or roof hole/openings.
- C. All floor, roof openings or hole into which a person can accidentally walk or fall through shall be guarded either by a railing system with toeboards along all exposed sides or a load-bearing cover. When the cover is not in place, the opening or hole shall be protected by a removable guardrail system or shall be attended when the guarding system has been removed, or other fall protection system.
 - 1. Covers shall be capable of supporting, without failure, at least twice the weight of the worker, equipment and material combined.
 - 2. Covers shall be secured when installed, clearly marked with the word "HOLE", "COVER" or "Danger, Roof Opening-Do Not Remove" or color-coded or equivalent methods (e.g., red or orange "X"). Workers must be made aware of the meaning for color coding and equivalent methods.
 - 3. Roofing material, such as roofing membrane, insulation or felts, covering or partly covering openings or holes, shall be immediately cut out. No hole or opening shall be left unattended unless covered.
 - 4. Non-load-bearing skylights shall be guarded by a load-bearing skylight screen, cover, or railing system along all exposed sides.
 - 5. Workers are prohibited from standing/walking on skylights.

- - - E N D - - -

Attachment A – Sample Hot Work Permit

(Front)

HOT WORK PERMIT

FOR CUTTING AND WELDING

WITH PORTABLE GAS OR ARC EQUIPMENT

Date: _____

Building/Location: _____

Dept _____ Floor _____

Work To Be Done: _____

Special Precautions: _____

Fire Watch Required: _____Yes _____No

The location where this work is to be performed has been examined, necessary precautions have been taken, and permission is granted for this work. (See Page A2).

Date Permit Expires: _____

Signed _____

(Individual responsible for authorizing
welding and cutting)

Time Hot Work Started: _____ Time Hot Work Completed: _____

FINAL CHECK-UP

Work area and all adjacent areas to which sparks and heat might have spread (including floors above and below and on opposite sides of walls) were inspected 30 minutes after the work was completed and were found fire safe.

Signed _____

(Contractor's Fire Watch)

(Rear)

ATTENTION

Before approving any cutting and welding permit, the contractor's authorized representative or their appointee shall inspect the work area and confirm that precautions have been taken to prevent fire in accordance with NFPA Standard No. 51B.

PRECAUTIONS

- ☐ Sprinklers in service
- ☐ Cutting and welding equipment in good repair

WITHIN 35 FT. OF WORK

- ☐ Floors swept clean of combustible
- ☐ Combustible floors wet down, covered with damp sand, metal or other shields
- ☐ No combustible material or flammable liquids
- ☐ All wall and floor openings covered
- ☐ Covers suspended beneath work to collect sparks

WORK ON WALLS OR CEILINGS

- ☐ Construction noncombustible and without combustible covering
- ☐ Combustibles moved away from opposite side of wall

WORK ON ENCLOSED EQUIPMENT

(Tanks, containers, ducts, dust collectors, etc)

- ☐ Equipment cleaned of all combustibles
- ☐ Containers purged of flammable vapors

FIRE WATCH

- ☐ To be provided during and 30 minutes after operation
- ☐ Supplied with extinguisher with and small hose

- ☐ Trained in use of equipment and in sounding a fire alarm

FINAL CHECK-UP

- ☐ To be made 30 minutes after completion of any operation`

Signed _____

(Supervisor)

SECTION 01 42 19
REFERENCE STANDARDS

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies the availability and source of references and standards specified in the project manual under paragraphs APPLICABLE PUBLICATIONS and/or shown on the drawings.

1.2 AVAILABILITY OF SPECIFICATIONS LISTED IN THE GSA INDEX OF FEDERAL SPECIFICATIONS, STANDARDS AND COMMERCIAL ITEM DESCRIPTIONS FPMR PART 101-29 (FAR 52.211-1) (AUG 1998)

- A. The GSA Index of Federal Specifications, Standards and Commercial Item Descriptions, FPMR Part 101-29 and copies of specifications, standards, and commercial item descriptions cited in the solicitation may be obtained for a fee by submitting a request to – GSA Federal Supply Service, Specifications Section, Suite 8100, 470 East L'Enfant Plaza, SW, Washington, DC 20407, Telephone (202) 619-8925, Facsimile (202) 619-8978.
- B. If the General Services Administration, Department of Agriculture, or Department of Veterans Affairs issued this solicitation, a single copy of specifications, standards, and commercial item descriptions cited in this solicitation may be obtained free of charge by submitting a request to the addressee in paragraph (a) of this provision. Additional copies will be issued for a fee.

1.3 AVAILABILITY FOR EXAMINATION OF SPECIFICATIONS NOT LISTED IN THE GSA INDEX OF FEDERAL SPECIFICATIONS, STANDARDS AND COMMERCIAL ITEM DESCRIPTIONS (FAR 52.211-4) (JUN 1988)

The specifications and standards cited in this solicitation can be examined at the following location:

DEPARTMENT OF VETERANS AFFAIRS
Office of Construction & Facilities Management
Facilities Quality Service (00CFM1A)
425 Eye Street N.W., (sixth floor)

Washington, DC 20001

Telephone Numbers: (202) 632-5249 or (202) 632-5178

Between 9:00 AM - 3:00 PM

1.4 AVAILABILITY OF SPECIFICATIONS NOT LISTED IN THE GSA INDEX OF FEDERAL SPECIFICATIONS, STANDARDS AND COMMERCIAL ITEM DESCRIPTIONS (FAR 52.211-3) (JUN 1988)

The specifications cited in this solicitation may be obtained from the associations or organizations listed below.

AA Aluminum Association Inc.

<http://www.aluminum.org>

AABC Associated Air Balance Council

<http://www.aabchq.com>

AAMA American Architectural Manufacturer's Association

<http://www.aamanet.org>

AASHTO American Association of State Highway and Transportation Officials

<http://www.aashto.org>

AATCC American Association of Textile Chemists and Colorists

<http://www.aatcc.org>

ACGIH American Conference of Governmental Industrial Hygienists

<http://www.acgih.org>

ACI American Concrete Institute

<http://www.aci-int.net>

ACPA American Concrete Pipe Association

<http://www.concrete-pipe.org>

ACPPA American Concrete Pressure Pipe Association

<http://www.acppa.org>

ADC	Air Diffusion Council http://flexibleduct.org
AGA	American Gas Association http://www.aga.org
AGC	Associated General Contractors of America http://www.agc.org
AGMA	American Gear Manufacturers Association, Inc. http://www.agma.org
AH	American Hort https://www.americanhort.org
AHAM	Association of Home Appliance Manufacturers http://www.aham.org
AIA	American Institute of Architects http://www.aia.org
AISC	American Institute of Steel Construction http://www.aisc.org
AISI	American Iron and Steel Institute http://www.steel.org
AITC	American Institute of Timber Construction https://aitc-glulam.org
AMCA	Air Movement and Control Association, Inc. http://www.amca.org
ANSI	American National Standards Institute, Inc. http://www.ansi.org

APA	The Engineered Wood Association http://www.apawood.org
ARI	Air-Conditioning and Refrigeration Institute http://www.ari.org
ARPM	Association for Rubber Product Manufacturers https://arpm.com
ASABE	American Society of Agricultural and Biological Engineers https://www.asabe.org
ASCE	American Society of Civil Engineers http://www.asce.org
ASHRAE	American Society of Heating, Refrigerating, and Air-Conditioning Engineers http://www.ashrae.org
ASME	American Society of Mechanical Engineers http://www.asme.org
ASSE	American Society of Sanitary Engineering International http://www.asse-plumbing.org
ASTM	American Society for Testing and Materials International http://www.astm.org
AWI	Architectural Woodwork Institute https://www.awinet.org
AWS	American Welding Society https://www.aws.org
AWWA	American Water Works Association https://www.awwa.org

BHMA Builders Hardware Manufacturers Association

<https://www.buildershardware.com>

BIA The Brick Industry Association

<http://www.gobrick.com>

CAGI Compressed Air and Gas Institute

<https://www.cagi.org>

CGA Compressed Gas Association, Inc.

<https://www.cganet.com>

CI The Chlorine Institute, Inc.

<https://www.chlorineinstitute.org>

CISCA Ceilings and Interior Systems Construction Association

<https://www.cisca.org>

CISPI Cast Iron Soil Pipe Institute

<https://www.cispi.org>

CLFMI Chain Link Fence Manufacturers Institute

<https://www.chainlinkinfo.org>

CPA Composite Panel Association

<https://www.compositepanel.org>

CPMB Concrete Plant Manufacturers Bureau

<https://www.cpmb.org>

CRA California Redwood Association

<http://www.calredwood.org>

CRSI Concrete Reinforcing Steel Institute

<https://www.crsi.org>

CTI Cooling Technology Institute

<https://www.cti.org>

DHA Decorative Hardwoods Association

<https://www.decorativehardwood.org>

DHIDoor and Hardware Institute

<https://www.dhi.org>

EGSA Electrical Generating Systems Association

<http://www.egsa.org>

EEI Edison Electric Institute

<https://www.eei.org>

EPA United States Environmental Protection Agency

<https://www.epa.gov>

ETLETL Testing Services

<http://www.intertek.com>

FAA Federal Aviation Administration

<https://www.faa.gov>

FCC Federal Communications Commission

<https://www.fcc.gov>

FPSForest Products Society

<http://www.forestprod.org>

GANAGlass Association of North America

<http://www.glasswebsite.com>

FM Factory Mutual Global Insurance

<https://www.fmglobal.com>

GA	Gypsum Association https://gypsum.org
GSA	General Services Administration https://www.gsa.gov
HI	Hydraulic Institute http://www.pumps.org
ICC	International Code Council https://shop.iccsafe.org
ICEA	Insulated Cable Engineers Association https://www.icea.net
ICAC	Institute of Clean Air Companies http://www.icac.com
IEEE	Institute of Electrical and Electronics Engineers https://www.ieee.org
IGMA	Insulating Glass Manufacturers Alliance https://www.igmaonline.org
IMSA	International Municipal Signal Association http://www.imsasafety.org
MBMA	Metal Building Manufacturers Association https://www.mbma.com
MSS	Manufacturers Standardization Society of the Valve and Fittings Industry http://msshq.org
NAAMM	National Association of Architectural Metal Manufacturers https://www.naamm.org

PHCC	Plumbing-Heating-Cooling Contractors Association https://www.phccweb.org
NBS	National Bureau of Standards See - NIST
NBBI	The National Board of Boiler and Pressure Vessel Inspectors https://www.nationalboard.org
NEC	National Electric Code See - NFPA National Fire Protection Association
NEMA	National Electrical Manufacturers Association https://www.nema.org
NFPA	National Fire Protection Association https://www.nfpa.org
NHLA	National Hardwood Lumber Association https://www.nhla.com
NIH	National Institute of Health https://www.nih.gov
NIST	National Institute of Standards and Technology https://www.nist.gov
NELMA	Northeastern Lumber Manufacturers Association, Inc. http://www.nelma.org
NPA	National Particleboard Association (See CPA, Composite Panel Association)
NSF	National Sanitation Foundation http://www.nsf.org

OSHA Occupational Safety and Health Administration
Department of Labor
<https://www.osha.gov>

PCA Portland Cement Association
<https://www.cement.org>

PCI Precast Prestressed Concrete Institute
<https://www.pci.org>

PPI Plastics Pipe Institute
<https://www.plasticpipe.org>

PEI Porcelain Enamel Institute
<http://www.porcelainenamel.com>

PTI Post-Tensioning Institute
<http://www.post-tensioning.org>

RFCI Resilient Floor Covering Institute
<https://www.rfci.com>

RIS Redwood Inspection Service
(See Western Wood Products Association)
<https://www.wwpa.org>

SCMA Southern Cypress Manufacturers Association
<http://www.cypressinfo.org>

SDI Steel Door Institute
<http://www.steeldoor.org>

SJI Steel Joist Institute
<https://www.steeljoist.org>

- SMACNA Sheet Metal & Air-Conditioning Contractors'
National Association
<https://www.smacna.org>
- SSPC The Society for Protective Coatings
<https://www.sspc.org>
- STI Steel Tank Institute
<https://www.steeltank.com>
- SWI Steel Window Institute
<https://www.steelwindows.com>
- TCNA Tile Council of North America
<https://www.tcnatile.com>
- TEMA Tubular Exchanger Manufacturers Association
<http://www.tema.org>
- TPI Truss Plate Institute
<https://www.tpinst.org>
- UBC The Uniform Building Code
(See ICC)
- UL Underwriters' Laboratories Incorporated
<https://www.ul.com>
- ULC Underwriters' Laboratories of Canada
<https://www.ulc.ca>
- WCLB West Coast Lumber Inspection Bureau
<http://www.wclib.org>
- WDMA Window and Door Manufacturers Association

<https://www.wdma.com>

WRCLA Western Red Cedar Lumber Association

<https://www.realcedar.com>

WWPA Western Wood Products Association

<http://www.wwpa.org>

--- E N D ---

**SECTION 01 45 00
QUALITY CONTROL**

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies requirements for Contractor Quality Control (CQC) for Design-Bid-Build (DBB) or Design-Build (DB) construction projects. This section can be used for both project types.

1.2 APPLICABLE PUBLICATIONS

- A. The publication listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.
- B. ASTM International (ASTM)
 - 1. D3740 - (2012a) Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
 - 2. E329 - (2014a) Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction

1.3 SUBMITTALS

Government approval is required for all submittals. CQC inspection reports shall be submitted under this Specification section and follow the [Applicable CQC Control Phase (Preparatory, Initial, or Follow-Up)]: [Applicable Specification section] naming convention.

- 1. Preconstruction Submittals
 - a. Interim CQC Plan
 - b. CQC Plan
 - c. Additional Requirements for Design Quality Control (DQC) Plan
- 2. Design Data
 - a. Discipline-Specific Checklists
 - b. Design Quality Control

3. Test Reports

a. Verification Statement

PART 2 PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

Establish and maintain an effective quality control (QC) system. that complies with the FAR Clause 52.246.12 titled "Inspection of Construction". QC consists of plans, procedures, and organization necessary to produce an end product which complies with the Contract requirements. The QC system covers all design and construction operations, both onsite and offsite, and be keyed to the proposed design and construction sequence. The project superintendent will be held responsible for the quality of work and is subject to removal by the Contracting Office or Authorized designee for non-compliance with the quality requirements specified in the Contract. In this context the highest level manager responsible for the overall construction activities at the site, including quality and production is the project superintendent. The project superintendent maintains a physical presence at the site at all times and is responsible for all construction and related activities at the site, except as otherwise acceptable to the Contracting Officer.

3.2 CQC PLAN:

- A. Submit the CQC Plan no later than CO or Designee to determine during Constructability review – 15/30/60 days after receipt of Notice to Proceed (NTP) proposed to implement the requirements of the FAR Clause 52.246.12 titled "Inspection of Construction". The Government will consider an Interim CQC Plan for the first days of operation, which must be accepted within 5, 10, or 20 business days of NTP. Design and/or construction will be permitted to begin only after acceptance of the CQC Plan or acceptance of an Interim plan applicable to the particular feature of work to be started. Work outside of the

accepted Interim CQC Plan will not be permitted to begin until acceptance of a CQC Plan or another Interim CQC Plan containing the additional work scope is accepted.

- B. Content of the CQC Plan: Include, as a minimum, the following to cover all design and construction operations, both onsite and offsite, including work by subcontractors, designers of record consultants, architects/engineers (A/E), fabricators, suppliers, and purchasing agents:
1. A description of the QC organization, including a chart showing lines of authority and acknowledgement that the CQC staff will implement the three phase control system for all aspects of the work specified. Include a CQC System Manager that reports to the project superintendent.
 2. The name, qualifications (in resume format) duties, responsibilities, and authorities of each person assigned a CQC function.
 3. A copy of the letter to the CQC System Manager signed by an authorized official of the firm which describes the responsibilities and delegates sufficient authorities to adequately perform the functions of the CQC System Manager, including authority to stop work which is not in compliance with the Contract. Letters of direction to all other various quality control representatives outlining duties, authorities, and responsibilities will to the Contracting Officer or Authorized designee be issued by the CQC System Manager. Furnish copies of these letters
 4. Procedures for scheduling, reviewing, certifying, and managing submittals including those of subcontractors, designers of record, consultants, A/E's offsite fabricators, suppliers and purchasing agents. These procedures must be in accordance with Section 01 33 23 Shop Drawings, Product Data, and Samples.
 5. Control, verification, and acceptance of testing procedures for each specific test to include the test name, specification paragraph requiring test, feature of work to be tested, test frequency, and person responsible for each test. (Laboratory facilities approved by the Contracting Officer or Authorized designee are required to be used)

6. Procedures for tracking Preparatory, Initial, and Follow-Up control phases and control, verification, and acceptance tests including documentation.
 7. Procedures for tracking design and construction deficiencies from identification through acceptable corrective action. Establish verification procedures that identified deficiencies have been corrected.
 8. Reporting procedures, including proposed reporting formats.
 9. A list of the definable features of work. A definable feature of work is a task which is separate and distinct from other tasks has separate control requirements, and is identified by different trades or disciplines, or it is work by the same trade in a different environment. Although each section of specifications can generally be considered as a definable feature of work, there are frequently more than one definable feature under a particular section. This list will be agreed upon during the Coordination meeting.
 10. Coordinate schedule work with Special Inspections required by Section 01 45 35 Special Inspections, the Statement of Special Inspections and Schedule of Special Inspections. Where the applicable Code issue by the International Code Council (ICC) calls for inspections by the Building Official, the Contractor must include the inspections in the CQC Plan and must perform the inspections required by the applicable ICC. The Contractor must perform these inspections using independent qualified inspectors. Include the Special Inspection Plan requirements in the CQC Plan.
- C. Additional Requirements for Design Quality Control (DQC) Plan: The following additional requirements apply to the DQC Plan for DB projects only and not DBB projects:
1. Submit and maintain a DQC Plan as an effective QC program which assures that all services required by this contract are performed and provided in a manner that meets professional architectural and engineering quality standards. As a minimum, all documents must be technically reviewed by competent, independent reviewers identified in the DQC Plan. The same element that produced the product may not

- perform the independent technical review (ITR). Correct errors and deficiencies in the design documents prior to submitting them to the Government.
2. Include the design schedule in the master project schedule, showing the sequence of events involved in carrying out the project design tasks within the specific Contract period. This should be at a detailed level of scheduling sufficient to identify all major design tasks, including those that control the flow of work. Include review and correction periods associated with each item. This should be a forward planning as well as a project monitoring tool. The schedule reflects calendar days and not dates for each activity. If the schedule is changed, submit a revised schedule reflecting the change within 7 calendar days. Include in the DQC Plan the discipline-specific checklists to be used during the design and quality control of each submittal. Submit at each design phase as part of the project documentation these completed discipline-specific checklists.
 3. Implement the DQC Plan by a DQC Manager who has the responsibility of being cognizant of and assuring that all documents on the project have been coordinated. This individual must be a person who has verifiable engineering or architectural design experience and is a Professional Engineer or Registered Architect within the state of Construction location. Notify the Contracting Officer or Authorized designee, in writing, of the name of the individual, and the name of an alternate person assigned to the position.
- D. Acceptance of Plan: Acceptance of the Contractor's plan is required prior to the start of design and construction. Acceptance is conditional and will be predicated on satisfactory performance during the design and construction. The Government reserves the right to require the Contractor to make changes in the CQC Plan and operations including removal of personnel as necessary, to obtain the quality specified.
- E. Notification of Changes: After acceptance of the CQC Plan, notify the Contracting Officer or Authorized designee in writing of any proposed change. Proposed changes are subject to acceptance by the Government prior to implementation by the Contractor.

3.3 COORDINATION MEETING:

After the Preconstruction Conference Post-award Conference before start of design or construction, and prior to acceptance by the Government of the CQC Plan, meet with the Contracting Officer or Authorized designee to discuss the Contractor's quality control system. Submit the CQC Plan a minimum of 2 business days prior to the Coordination Meeting. During the meeting, a mutual understanding of the system details must be developed, including the forms for recording the CC operations, design activities (if applicable), control activities, testing, administration of the system for both onsite and offsite work, and the interrelationship of Contractor's Management and control with the Government's Quality Assurance. Minutes of the meeting will be prepared by the Government, signed by both the Contractor and Contracting Officer or Authorized designee and will become a part of the contract file. There can be occasions when subsequent conferences will be called by either party to reconfirm mutual understandings or address deficiencies in the CQC system or procedures which can require corrective action by the Contractor.

3.4 QUALITY CONTROL ORGANIZATION:

- A. Personnel Requirements: The requirements for the CQC organization are a Safety and Health Manager, CQC System Manager, a Design Quality Manager (if applicable), and sufficient number of additional qualified personnel to ensure safety and Contract compliance. The Safety and Health Manager shall satisfy the requirements of Specification 01 35 26 Safety Requirements and reports directly to a senior project (or corporate) official independent from the CQC System Manager. The Safety and Health Manager will also serve as a member of the CQC Staff. Personnel identified in the technical provisions as requiring specialized skills to assure the required work is being performed properly will also be included as part of the CQC organization. The Contractor's CQC staff maintains a presence at the site at all times during progress of the work and have complete authority and responsibility to take any action necessary to ensure Contract compliance. The CQC staff will be subject to acceptance by the

Contracting Officer or Authorized designee. Provide adequate office space, filing systems, and other resources as necessary to maintain an effective and fully functional CQC organization. Promptly complete and furnish all letters, material submittals, shop drawings submittals, schedules and all other project documentation to the CQC organization. The CQC organization is responsible to maintain these documents and records at the site at all times, except as otherwise acceptable to the Government.

- B. CQC System Manager: Identify as CQC System Manager an individual within the onsite work organization that is responsible for overall management of CQC and has the authority to act in all CQC matters for the Contractor. The CQC system Manager is required to be a graduate engineer, graduate architect, or a graduate of construction management, with a minimum of PM or SRE to determine qualifications based on project complexity at construction review. This CQC System manager is on the site at all times during construction and is employed by the General Contractor. The CQC System Manger is assigned as a separate position and cannot be the project superintendent . Identify in the plan an alternate to serve in the event of the CDQC System Manager's absence. The requirements for the alternate are the same as the CQC System Manager.
- C. CQC Personnel: In addition to CQC personnel specified elsewhere in the contract, provide as part of the CQC organization specialized personnel to assist in the CQC System Manager for the following areas, as applicable: electrical, mechanical, civil, structural, environmental, architectural, materials technician submittals clerk, Commissioning Agent/LEED specialist, and low voltage systems. These individuals or specified technical companies are directly employed by the General Contractor and cannot be employed by a supplier or subcontractor on this project be responsible to the CQC System Manager; be physically present at the construction site during work on the specialized personnel's areas of responsibility; have the necessary education or experience in accordance with the Experience Matrix listed herein. These individuals can perform other duties but need to be allowed sufficient time to perform the specialized personnel's assigned quality controls duties as described in the CQC Plan. A single

person can cover more than one area provided that the single person is qualified to perform QC activities in each designated and that workload allows.

EXPERIENCE MATRIX

Area	Qualifications
Civil	Graduate Civil Engineer or Construction Manager with 2 years experience in the type of work being performed on this project or technician with 5 years related experience.
Mechanical	Graduate Mechanical Engineer with 2 years experience or construction professional with 5 years of experience supervising mechanical features of work in the field with a construction company.
Electrical	Graduate Electrical Engineer with 2 years related experience or construction professional with 5 years of experience supervising electrical features of work in the field with a construction company.
Structural	Graduate Civil Engineer (with Structural Track or Focus), Structural Engineer, or Construction Manager with 2 years experience or construction professional with 5 years experience supervising structural features of work in the field with a construction company.
Architectural	Graduate Architect with 2 years experience or construction professional with 5 years of related experience.
Environmental	Graduate Environmental Engineer with 3 years experience.
Submittals	Submittal Clerk with 1 year experience.
Concrete, Pavement, and Soils	Materials Technician with 2 years experience for the appropriate area.
Testing, Adjusting, and Balancing (TAB)	Specialist must be a member of AABC or an experienced technician of the firm certified by the NEBB.
Design Quality Control Manager	Registered Architect or Professional Engineer

D. Additional Requirements: In addition to the above experience and education requirements, the CQC System Manager and Alternate CQC System Manager are required to have completed the Construction Quality Management (CQM) for

Construction course. If the CQC System Manager does not have a current specification, obtain the CQM for Contractors course identification within 90 days of award. This course is periodically offered by the Naval Facilities Engineering Command and the Army Corps of Engineers. Contact the Contracting Officer or Authorized designee for information on the next scheduled class.

- E. Organizational Changes: Maintain the CQC staff at full strength at all times. When it is necessary to make changes to the CQC staff, revise the CQC Plan to reflect the changes and submit the changes to the Contracting Officer or Authorized designee for acceptance.

3.5 SUBMITTALS AND DELIVERABLES: Submittals have to comply with the requirements in Section 01 33 23 Shop Drawings, Product Data, and Samples. The CQC organization is responsible for certifying that all submittals and deliverables are in compliance with the contract requirements. When Section 01 91 00 General Commissioning Requirements is included in the contract, the submittals required by the section have to be coordinated with the Section 01 33 23 Shop Drawings, Product Data, and Samples to ensure adequate time is allowed for each type of submittal required.

3.6 CONTROL:

- A. CQC is the means by which the Contractor ensures that the construction, to include that of subcontractors and suppliers, complies with the requirements of the contract. At least three phases of control are required to be conducted by the CQC System Manager for each definable feature of the construction work as follows:
 - 1. Preparatory Phase: This phase is performed prior to beginning work on each definable feature of work after all required plans/documents/materials are approved/accepted, and after copies are at the work site. This phase includes:
 - a. A review of each paragraph of applicable specifications, references codes, and standards. Make available during the preparatory inspection a copy of those sections of referenced codes and standards applicable to that portion of the

work to be accomplished in the field. Maintain and make available in the field for use by Government personnel until final acceptance of the work.

- b. Review of the Contract drawings.
- c. Check to assure that all materials and equipment have been tested, submitted, and approved.
- d. Review of provisions that have been made to provide required control inspection and testing.
- e. Review Special Inspections required by Section 01 45 35 Special Inspections, that Statement of Special Inspections and the Schedule of Specials Inspections.
- f. Examination of the work area to assure that all required preliminary work has been completed and is in compliance with the Contract.
- g. Examination of required materials, equipment, and sample work to assure that they are on hand conform to approved shop drawings or submitted data, and are properly stored.
- h. Review of the appropriate Activity Hazard Analysis (AHA) to assure safety requirements are met.
- i. Discussion of procedures for controlling quality of the work including repetitive deficiencies. Document construction tolerances and workmanship standards – contract defined or industry standard if not contract defined - for that feature of work.
- j. Check to ensure that the portion of the plan for the work to be performed has been accepted by the Contracting Officer.
- k. Discussion of the initial control phase.
- l. The Government needs to be notified at least 48 hours or 2 business days in advance of beginning the Preparatory control phase. Include a meeting conducted by the CQC System Manager and attended by the superintendent, other CQC personnel (as applicable), and the foreman responsible for the definable feature. Document the results of the Preparatory phase actions by separate minutes prepared by the CQC System Manager and attach to the daily

CQC report. Instruct applicable workers as to the acceptable level of workmanship required in order to meet contract specifications.

B. Initial Phase: This phase is accomplished at the beginning of a definable feature of work.

Accomplish the following:

1. Check work to ensure that it is in full compliance with contract requirements.
Review minutes of the Preparatory meeting.
2. Verify adequacy of controls to ensure full contract compliance. Verify the required control inspection and testing is in compliance with the contract.
3. Establish level of workmanship and verify that it meets minimum acceptable workmanship standards. Compare with required sample panels as appropriate.
4. Resolve all differences.
5. Check safety to include compliance with an upgrading of the safety plan and activity hazard analysis. Review the activity analysis with each worker.
6. The Government needs to be notified at least 48 hours or 2 business days in advance of beginning the initial phase for definable features of work. Prepare separate minutes of this phase by the CQC System Manager and attach to the daily CQC report. Indicate the exact location of initial phase for definable feature of work for future reference and comparison with Follow-Up phases.
7. The initial phase for each definable feature of work is repeated for each new crew to work onsite, or any time acceptable specified quality standards are not being met.
8. Coordinate scheduled work with Special Inspections required by Section 01 45 35 Special Inspections, the Statement of Special Inspections, and the Schedule of Special Inspections.

C. Follow-Up Phase: Perform daily checks to assure control activities, including control testing, are providing continued compliance with contract requirements until the completion of the particular feature of work. Record the checks in the CQC documentation. Conduct final Follow-Up checks and correct all deficiencies prior to the start of additional features of work which may be affected by the deficient

work. Do not build upon nor conceal non-conforming work. Coordinate scheduled work with Special Inspections required by Section 01 45 35 Special Inspections, the Statement of Special Inspections, and the Schedule of Special Inspections

- D. Additional Preparatory and Initial Phases on the same definable features of work if: the quality ongoing work is unacceptable; if there are changes in the applicable CQC staff, onsite production supervision or work crew; if work on a definable feature is resumed after a substantial period of inactivity, or if other problems develop.

3.7 TESTS

- A. Testing Procedure: Perform specified or required tests to verify that control measures are adequate to provide a product which conforms to contract requirements. Upon request, furnish to the Government duplicate samples of test specimens for possible testing by the Government. Testing includes operation and acceptance test when specified. Procure the services of a Department of Veteran Affairs approved testing laboratory or establish an approved testing laboratory at the project site. Perform the following activities and record and provide the following data:
- 1 . Verify that testing procedures comply with contract requirements.
 - 2 . Verify that facilities and testing equipment are available and comply with testing standards.
 - 3 . Check test instrument calibration data against certified standards.
 - 4 . Verify that recording forms and test identification control number system, including all of the test documentation requirements, have been prepared.
 - 5 . Record results of all tests taken, both passing and failing on the CQC report for the date taken. Specification paragraph reference, location where tests were taken, and the unique sequential control number identifying the test. If approved by the Contracting Officer or Authorized designee, actual test reports are submitted later with a reference to the test number and date taken. Provide an information copy of tests performed by an offsite or commercial test facility directly to the Contracting Officer or Authorized designee. Failure to submit timely test reports as stated

results in nonpayment for related work performed and disapproval of the test facility for this Contract.

- B. Testing Laboratories: All testing laboratories must be validated through the procedures contained in Specification section 01 45 29 Testing Laboratory Services.
 - 1. Capability Check: The Government reserves the right to check laboratory equipment in the proposed laboratory for compliance with the standards set forth in the contract specifications and to check the laboratory technician's testing procedures and techniques. Laboratories utilized for testing soils, concrete, asphalt and steel is required to meet criteria detailed in ASTM D3740 and ASTM E329.
 - 2. Capability Recheck: If the selected laboratory fails the capability check, the Contractor will be assessed a charge equal to value of recheck to reimburse the Government for each succeeding recheck of the laboratory or the checking of a subsequently selected laboratory. Such costs will be deducted from the Contract amount due the Contractor.
- C. Onsite Laboratory: The Government reserves the right to utilize the Contractor's control testing laboratory and equipment to make assurance tests, and to check the Contractor's testing procedures, techniques, and test results at no additional cost to the Government.

3.8 COMPLETION INSPECTION

- A. Punch-Out Inspection: Conduct an inspection of the work by the CQC system Manager near the end of the work, or any increment of the work established by the specifications. Prepare and include in the CQC documentation a punch list of items which do not conform to the approved drawings and specifications. Include within the list of deficiencies the estimated date by which the deficiencies will be corrected. Make a second inspection the CQC System Manager or staff to ascertain that all deficiencies have been corrected. Once this is accomplished, notify the Government that the facility is ready for the Government Pre-Final Inspection.

- B. Pre-Final Inspection: The Government will perform the Pre-Final Inspection to verify that the facility is complete and ready to be occupied. A Government Pre-Final Punch List may be developed as a result of this inspection. Ensure that all items on this list have been corrected before notifying the Government, so that a Final Acceptance Inspection with the customer can be scheduled. Correct any items noted on the Pre-Final Inspection in a timely manner. These inspections and any deficiency corrections required by this paragraph need to be accomplished within the time slated for completion of the entire work or any particular increment of the work if the project is divided into increments by separate construction completion dates.
- C. Final Acceptance Inspection: The Contractor's QC Inspection personnel, plus the superintendent or other primary management person, and the Contracting Officer's Authorized designee is required to be in attendance at the Final Acceptance Inspection. Additional Government personnel can also be in attendance. The Final Acceptance Inspection will be formally scheduled by the Contracting Officer's or Authorized designee based upon results of the Pre-Final Inspection. Notify the Contracting Officer through the Resident Engineer office at least 14 days prior to the Final Acceptance Inspection and include the Contractor's assurance that all specific items previously identified to the Contractor as being unacceptable, along with all remaining work performed under the contract, will be complete and acceptable by the date schedule for the Final Acceptance Inspection. Failure of the Contractor to have all contract work acceptably complete for this inspection will be cause for the Contracting Officer to bill the Contractor for the Government's additional inspection cost in accordance with FAR Clause 52.246-12 titled "Inspection of Construction".

3.9 DOCUMENTATION

- A. Quality Control Activities: Maintain current records providing factual evidence that required QC activities and tests have been performed. Include in these records the work of subcontractors and suppliers on an acceptable form that includes, as a minimum, the following information:

1. The name and area of responsibility of the Contractor/Subcontractor
 2. Operating plant/equipment with hours worked, idle, or down for repair.
 3. Work performed each day, giving location, description, and by whom. When Network Analysis (NAS) is used, identify each phase of work performed each day by NAS activity number.
 4. Test and control activities performed with results and references to specification/drawing requirements. Identify the Control Phase (Preparatory, Initial, and/or Follow-Up). List deficiencies noted, along with corrective action.
 5. Quantity of materials received at the site with statement as to acceptability, storage, and reference to specification/drawing requirements.
 6. Submittals and deliverables reviewed, with Contract reference, by whom, and action taken.
 7. Offsite surveillance activities, including actions taken.
 8. Job safety evaluations stating what was checked, results, and instructions or corrective actions.
 9. Instructions given/received and conflicts in plans and specifications.
 10. Provide documentation of design quality control activities. For independent design reviews, provide, as a minimum, identification of the Independent Technical Reviewer (ITR) team, the ITR review comments, responses, and the record of resolution of the comments.
- B. Verification Statement: Indicate a description of trades working on the project; the number of personnel working; weather conditions encountered; and any delays encountered. Cover both conforming and deficient features and include a statement that equipment and materials incorporated in the work and workmanship comply with the Contract. Furnish the original and one copy of these records in report form to the Government daily with 1 week after the date covered by the report, except that reports need not be submitted for days on which no work is performed. As a minimum, prepare and submit on report for every 7 days of no work and on the last day of a no work period. All calendar days need to be accounted for throughout the life of the contract.

The first report following a day of no work will be for that day only. Reports need to be signed and dated by the CQC System Manager. Include copies of test reports and copies of reports prepared by all subordinate QC personnel within the CQC System Manager Report.

3.10 SAMPLE FORMS

Templates of various quality control reports can be found on the Whole Building Design Guide website at https://www.wbdg.org/FFC/NAVGRAPH/quality_control_reports.pdf

- 3.11 NOTIFICATION OF NONCOMPLIANCE:** The Contracting Officer or Authorized designee will notify the Contractor of any detected noncompliance with the foregoing requirements. The Contractor should take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the work site will be deemed sufficient for the purpose of notification. If the Contractor fails or refuses to comply promptly, the Contracting Officer can issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to such stop orders will be made the subject of claim for extension of time or for excess costs or damages by the Contractor.

--- End of Section ---

SECTION 01 45 29
TESTING LABORATORY SERVICES

PART 1 – GENERAL

1.1 DESCRIPTION:

This section specifies materials testing activities and inspection services required during project construction to be provided by a Testing Laboratory retained by the General Contractor.

1.2 APPLICABLE PUBLICATIONS:

- 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. American Association of State Highway and Transportation Officials (AASHTO):

T27-11Standard Method of Test for Sieve Analysis of Fine and
Coarse Aggregates

T96-02 (R2006).....Standard Method of Test for Resistance to Degradation of
Small-Size Coarse Aggregate by Abrasion and Impact in the
Los Angeles Machine

T99-10Standard Method of Test for Moisture-Density Relations of
Soils Using a 2.5 Kg (5.5 lb.) Rammer and a 305 mm (12 in.)
Drop

T104-99 (R2007).....Standard Method of Test for Soundness of Aggregate by
Use of Sodium Sulfate or Magnesium Sulfate

T180-10Standard Method of Test for Moisture-Density Relations of
Soils using a 4.54 kg (10 lb.) Rammer and a 457 mm (18 in.)
Drop

T191-02(R2006).....Standard Method of Test for Density of Soil In-Place by the
Sand-Cone Method

T310-13Standard Method of Test for In-place Density and Moisture
Content of Soil and Soil-aggregate by Nuclear Methods
(Shallow Depth)

C. American Concrete Institute (ACI):

506.4R-94 (R2004)Guide for the Evaluation of Shotcrete

D. American Society for Testing and Materials (ASTM):

A370-12Standard Test Methods and Definitions for Mechanical
Testing of Steel Products

A416/A416M-10Standard Specification for Steel Strand, Uncoated Seven-
Wire for Prestressed Concrete

C31/C31M-10Standard Practice for Making and Curing Concrete Test
Specimens in the Field

C33/C33M-11aStandard Specification for Concrete Aggregates

C39/C39M-12Standard Test Method for Compressive Strength of
Cylindrical Concrete Specimens

C109/C109M-11bStandard Test Method for Compressive Strength of
Hydraulic Cement Mortars

C136-06Standard Test Method for Sieve Analysis of Fine and
Coarse Aggregates

C138/C138M-10bStandard Test Method for Density (Unit Weight), Yield, and
Air Content (Gravimetric) of Concrete

C140-12Standard Test Methods for Sampling and Testing Concrete
Masonry Units and Related Units

C143/C143M-10aStandard Test Method for Slump of Hydraulic Cement
Concrete

C172/C172M-10Standard Practice for Sampling Freshly Mixed Concrete

C173/C173M-10bStandard Test Method for Air Content of freshly Mixed
Concrete by the Volumetric Method

C330/C330M-09Standard Specification for Lightweight Aggregates for
Structural Concrete

C567/C567M-11Standard Test Method for Density Structural Lightweight
Concrete

C780-11	Standard Test Method for Pre-construction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry
C1019-11	Standard Test Method for Sampling and Testing Grout
C1064/C1064M-11	Standard Test Method for Temperature of Freshly Mixed Portland Cement Concrete
C1077-11c	Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation
C1314-11a	Standard Test Method for Compressive Strength of Masonry Prisms
D422-63(2007)	Standard Test Method for Particle-Size Analysis of Soils
D698-07e1	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort
D1140-00(2006)	Standard Test Methods for Amount of Material in Soils Finer than No. 200 Sieve
D1143/D1143M-07e1	Standard Test Methods for Deep Foundations Under Static Axial Compressive Load
D1188-07e1	Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Coated Samples
D1556-07	Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
D1557-09	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000ft lbf/ft ³ (2,700 kNm/m ³))
D2166-06	Standard Test Method for Unconfined Compressive Strength of Cohesive Soil
D2167-08)	Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method

D2216-10.....	Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
D2974-07a.....	Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils
D3666-11.....	Standard Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials
D3740-11.....	Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as used in Engineering Design and Construction
D6938-10.....	Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
E94-04(2010).....	Standard Guide for Radiographic Examination
E164-08	Standard Practice for Contact Ultrasonic Testing of Weldments
E329-11c.....	Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection
E543-09	Standard Specification for Agencies Performing Non- Destructive Testing
E605-93(R2011)	Standard Test Methods for Thickness and Density of Sprayed Fire Resistive Material (SFRM) Applied to Structural Members
E709-08	Standard Guide for Magnetic Particle Examination
E1155-96(R2008)	Determining FF Floor Flatness and FL Floor Levelness Numbers
F3125/F3125M-15	Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and

150 ksi (1040 MPa) Minimum Tensile Strength, Inch and
Metric Dimensions

E. American Welding Society (AWS):

D1.D1.1M-10.....Structural Welding Code-Steel

1.3 REQUIREMENTS:

- A. Accreditation Requirements: Construction materials testing laboratories must be accredited by a laboratory accreditation authority and will be required to submit a copy of the Certificate of Accreditation and Scope of Accreditation. The laboratory's scope of accreditation must include the appropriate ASTM standards (i.e.; E329, C1077, D3666, D3740, A880, E543) listed in the technical sections of the specifications. Laboratories engaged in Hazardous Materials Testing shall meet the requirements of OSHA and EPA. The policy applies to the specific laboratory performing the actual testing, not just the "Corporate Office."
- B. Inspection and Testing: Testing laboratory shall inspect materials and workmanship and perform tests described herein and additional tests requested by Resident Engineer. When it appears materials furnished, or work performed by Contractor fail to meet construction contract requirements, Testing Laboratory shall direct attention of Resident Engineer to such failure.
- C. Written Reports: Testing laboratory shall submit test reports to Resident Engineer, Contractor, unless other arrangements are agreed to in writing by the Resident Engineer. Submit reports of tests that fail to meet construction contract requirements on colored paper.
- D. Verbal Reports: Give verbal notification to Resident Engineer immediately of any irregularity.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 EARTHWORK:

- A. General: The Testing Laboratory shall provide qualified personnel, materials, equipment, and transportation as required to perform the services identified/required herein,

within the agreed to schedule and/or time frame. The work to be performed shall be as identified herein and shall include but not be limited to the following:

1. Observe fill and subgrades during proof-rolling to evaluate suitability of surface material to receive fill or base course. Provide recommendations to the Resident Engineer regarding suitability or unsuitability of areas where proof-rolling was observed. Where unsuitable results are observed, witness excavation of unsuitable material and recommend to Resident Engineer extent of removal and replacement of unsuitable materials and observe proof-rolling of replaced areas until satisfactory results are obtained.
2. Provide part time observation of fill placement and compaction and field density testing in building areas and provide part time observation of fill placement and compaction and field density testing in pavement areas to verify that earthwork compaction obtained is in accordance with contract documents.
3. Provide supervised geotechnical technician to inspect excavation, subsurface preparation, and backfill for structural fill.

B. Testing Compaction:

1. Determine maximum density and optimum moisture content for each type of fill, backfill and subgrade material used, in compliance with AASHTO T99/T180 Method A, ASTM D698, D1557 Method A, ASTM D698 and/or ASTM D1557.
2. Make field density tests in accordance with the primary testing method following ASTM D6938 or AASHTO T310 wherever possible. Field density tests utilizing ASTM D1556, AASHTO T191 , or ASTM D2167 shall be utilized on a case by case basis only if there are problems with the validity of the results from the primary method due to specific site field conditions. Should the testing laboratory propose these alternative methods, they should provide satisfactory explanation to the Resident Engineer before the tests are conducted.
 - a. Building Slab Subgrade: At least one test of subgrade for every 185 m² (2000 square feet) of building slab, but in no case fewer than three tests. In each

compacted fill layer, perform one test for every 185 m² (2000 square feet) of overlaying building slab, but in no case fewer than three tests.

- b. Foundation Wall Backfill: One test per 30 m (100 feet) of each layer of compacted fill but in no case fewer than two tests.
 - c. Pavement Subgrade: One test for each 335 m² (400 square yards), but in no case fewer than two tests.
 - d. Curb, Gutter, and Sidewalk: One test for each 90 m (300 feet), but in no case fewer than two tests.
 - e. Trenches: One test at maximum 30 m (100 foot) intervals per 1200 mm (4 foot) of vertical lift and at changes in required density, but in no case fewer than two tests.
 - f. Footing Subgrade: At least one test for each layer of soil on which footings will be placed. Subsequent verification and approval of each footing subgrade may be based on a visual comparison of each subgrade with related tested subgrade when acceptable to Resident Engineer. In each compacted fill layer below wall footings, perform one field density test for every 30 m (100 feet) of wall. Verify subgrade is level, all loose or disturbed soils have been removed, and correlate actual soil conditions observed with those indicated by test borings.
- C. Fill and Backfill Material Gradation: One test per 100 cubic yards stockpiled or in-place source material. Gradation of fill and backfill material shall be determined in accordance with ASTM C136.
- D. Testing for Footing Bearing Capacity: Evaluate if suitable bearing capacity material is encountered in footing subgrade.
- E. Testing Materials: Test suitability of on-site and off-site borrow as directed by Resident Engineer.

3.2 FOUNDATION PILES:

- A. Witness load test procedure for conformance with ASTM D1143 and interpret test data to verify geotechnical recommendations for pile capacity. Submit load test report in accordance with ASTM D1143.

- B. Review Contractor's equipment, methods, and procedures prior to starting any work on site. Provide continuous inspection of pile installation. Maintain a record of all pertinent phases of operation for submittal to Resident Engineer.
- C. Cast-in-Place Concrete Piles: Test concrete including materials for concrete as required in Article CONCRETE of this section, except make two test cylinders for each day's production of each strength of concrete produced.

3.4 LANDSCAPING:

- A. Test topsoil for organic materials, pH, phosphate, potash content, and gradation of particles.
 - 1. Test for organic material by using ASTM D2974.
 - 2. Determine percent of silt, sand, clay, and foreign materials such as rock, roots, and vegetation.
- B. Submit laboratory test report of topsoil to Resident Engineer.

3.5 ASPHALT CONCRETE PAVING:

- A. Aggregate Base Course:
 - 1. Determine maximum density and optimum moisture content for aggregate base material in accordance with AASHTO T180, Method D
 - 2. Make a minimum of three field density tests on each day's final compaction on each aggregate course in accordance with AASHTO T191
 - 3. Sample and test aggregate as necessary to insure compliance with specification requirements for gradation, wear, and soundness as specified in the applicable state highway standards and specifications.
- B. Asphalt Concrete:
 - 1. Aggregate: Sample and test aggregates in stock pile and hot-bins as necessary to insure compliance with specification requirements for gradation (AASHTO T27), wear (AASHTO T96), and soundness (AASHTO T104).
 - 2. Temperature: Check temperature of each load of asphalt concrete at mixing plant and at site of paving operation.

3. Density: Make a minimum of two field density tests in accordance with ASTM D1188 of asphalt base and surface course for each day's paving operation.

3.6 SITE WORK CONCRETE:

Test site work concrete including materials for concrete as required in Article CONCRETE of this section.

3.8 CONCRETE:

A. Batch Plant Inspection and Materials Testing:

1. Perform continuous batch plant inspection until concrete quality is established to satisfaction of Resident Engineer with concurrence of Contracting Officer and perform periodic inspections thereafter as determined by Resident Engineer.
2. Periodically inspect and test batch proportioning equipment for accuracy and report deficiencies to Resident Engineer.
3. Sample and test mix ingredients as necessary to insure compliance with specifications.
4. Sample and test aggregates daily and as necessary for moisture content. Test the dry rodded weight of the coarse aggregate whenever a sieve analysis is made, and when it appears there has been a change in the aggregate.
5. Certify, in duplicate, ingredients and proportions and amounts of ingredients in concrete conform to approved trial mixes. When concrete is batched or mixed off immediate building site, certify (by signing, initialing or stamping thereon) on delivery slips (duplicate) that ingredients in truck-load mixes conform to proportions of aggregate weight, cement factor, and water-cement ratio of approved trial mixes.

B. Field Inspection and Materials Testing:

1. Provide a technician at site of placement at all times to perform concrete sampling and testing.
2. Review the delivery tickets of the ready-mix concrete trucks arriving on-site. Notify the Contractor if the concrete cannot be placed within the specified time limits or if the type of concrete delivered is incorrect. Reject any loads that do not comply with the Specification requirements. Rejected loads are to be removed from the site at

- the Contractor's expense. Any rejected concrete that is placed will be subject to removal.
3. Take concrete samples at point of placement in accordance with ASTM C172. Mold and cure compression test cylinders in accordance with ASTM C31. Make at least three cylinders for each 40 m³ (50 cubic yards) or less of each concrete type, and at least three cylinders for any one day's pour for each concrete type. After good concrete quality control has been established and maintained as determined by Resident Engineer make three cylinders for each 80 m³ (100 cubic yards) or less of each concrete type, and at least three cylinders from any one day's pour for each concrete type. Label each cylinder with an identification number. Resident Engineer may require additional cylinders to be molded and cured under job conditions.
 4. Perform slump tests in accordance with ASTM C143. Test the first truck each day, and every time test cylinders are made. Test pumped concrete at the hopper and at the discharge end of the hose at the beginning of each day's pumping operations to determine change in slump.
 5. Determine the air content of concrete per ASTM C173. For concrete required to be air-entrained, test the first truck and every 20 m³ (25 cubic yards) thereafter each day. For concrete not required to be air-entrained, test every 80 m³ (100 cubic yards) at random. For pumped concrete, initially test concrete at both the hopper and the discharge end of the hose to determine change in air content.
 6. If slump or air content fall outside specified limits, make another test immediately from another portion of same batch.
 7. Perform unit weight tests in compliance with ASTM C138 for normal weight concrete and ASTM C567 for lightweight concrete. Test the first truck and each time cylinders are made.
 8. Notify laboratory technician at batch plant of mix irregularities and request materials and proportioning check.
 9. Verify that specified mixing has been accomplished.

10. Environmental Conditions: Determine the temperature per ASTM C1064 for each truckload of concrete during hot weather and cold weather concreting operations:
 - a. When ambient air temperature falls below 4.4 degrees C (40 degrees F), record maximum and minimum air temperatures in each 24 hour period; record air temperature inside protective enclosure; record minimum temperature of surface of hardened concrete.
 - b. When ambient air temperature rises above 29.4 degrees C (85 degrees F), record maximum and minimum air temperature in each 24 hour period; record minimum relative humidity; record maximum wind velocity; record maximum temperature of surface of hardened concrete.
11. Inspect the reinforcing steel placement, including bar size, bar spacing, top and bottom concrete cover, proper tie into the chairs, and grade of steel prior to concrete placement. Submit detailed report of observations.
12. Observe conveying, placement, and consolidation of concrete for conformance to specifications.
13. Observe condition of formed surfaces upon removal of formwork prior to repair of surface defects and observe repair of surface defects.
14. Observe curing procedures for conformance with specifications, record dates of concrete placement, start of preliminary curing, start of final curing, end of curing period.
15. Observe preparations for placement of concrete:
 - a. Inspect handling, conveying, and placing equipment, inspect vibrating and compaction equipment.
 - b. Inspect preparation of construction, expansion, and isolation joints.
16. Observe preparations for protection from hot weather, cold weather, sun, and rain, and preparations for curing.
17. Observe concrete mixing:
 - a. Monitor and record amount of water added at project site.
 - b. Observe minimum and maximum mixing times.

18. Measure concrete flatwork for levelness and flatness as follows:

- a. Perform Floor Tolerance Measurements F_F and F_L in accordance with ASTM E1155. Calculate the actual overall F- numbers using the inferior/superior area method.
- b. Perform all floor tolerance measurements within 48 hours after slab installation and prior to removal of shoring and formwork.
- c. Provide the Contractor and the Resident Engineer with the results of all profile tests, including a running tabulation of the overall F_F and F_L values for all slabs installed to date, within 72 hours after each slab installation.

19. Other inspections:

- a. Grouting under base plates.
- b. Grouting anchor bolts and reinforcing steel in hardened concrete.

C. Laboratory Tests of Field Samples:

1. Test compression test cylinders for strength in accordance with ASTM C39. For each test series, test one cylinder at 7 days and one cylinder at 28 days. Use remaining cylinder as a spare tested as directed by Resident Engineer. Compile laboratory test reports as follows: Compressive strength test shall be result of one cylinder, except when one cylinder shows evidence of improper sampling, molding or testing, in which case it shall be discarded and strength of spare cylinder shall be used.
2. Make weight tests of hardened lightweight structural concrete in accordance with ASTM C567.
3. Furnish certified compression test reports (duplicate) to Resident Engineer. In test report, indicate the following information:
 - a. Cylinder identification number and date cast.
 - b. Specific location at which test samples were taken.
 - c. Type of concrete, slump, and percent air.
 - d. Compressive strength of concrete in MPa (psi).
 - e. Weight of lightweight structural concrete in kg/m^3 (pounds per cubic feet).
 - f. Weather conditions during placing.

- g. Temperature of concrete in each test cylinder when test cylinder was molded.
- h. Maximum and minimum ambient temperature during placing.
- i. Ambient temperature when concrete sample in test cylinder was taken.
- j. Date delivered to laboratory and date tested.

3.9 REINFORCEMENT:

- A. Review mill test reports furnished by Contractor.
- B. Make one tensile and one bend test in accordance with ASTM A370 from each pair of samples obtained.
- C. Written report shall include, in addition to test results, heat number, manufacturer, type and grade of steel, and bar size.
- D. Perform tension tests of mechanical and welded splices in accordance with ASTM A370.

3.12 ARCHITECTURAL PRECAST CONCRETE:

- A. Inspection at Plant: Forms, placement of reinforcing steel, concrete cover, and placement and finishing of concrete.
- B. Concrete Testing: Test concrete including materials for concrete as required in Article CONCRETE of this section, except make two test cylinders for each day's production of each strength of concrete produced.
- C. Inspect members to insure specification requirements for curing and finishes have been met.

3.13 MASONRY:

- A. Mortar Tests:
 - 1. Laboratory compressive strength test:
 - a. Comply with ASTM C780.
 - b. Obtain samples during or immediately after discharge from batch mixer.
 - c. Furnish molds with 50 mm (2 inch), 3 compartment gang cube.
 - d. Test one sample at 7 days and 2 samples at 28 days.
 - 2. Two tests during first week of operation; one test per week after initial test until masonry completion.

B. Grout Tests:

1. Laboratory compressive strength test:
 - a. Comply with ASTM C1019.
 - b. Test one sample at 7 days and 2 samples at 28 days.
 - c. Perform test for each 230 m² (2500 square feet) of masonry.

C. Masonry Unit Tests:

1. Laboratory Compressive Strength Test:
 - a. Comply with ASTM C140.
 - b. Test 3 samples for each 460 m² (5000 square feet) of wall area.

D. Prism Tests: For each type of wall construction indicated, test masonry prisms per ASTM C1314 for each 460 m² (5000 square feet) of wall area. Prepare one set of prisms for testing at 7 days and one set for testing at 28 days.

3.14 STRUCTURAL STEEL:

A. General: Provide shop and field inspection and testing services to certify structural steel work is done in accordance with contract documents. Welding shall conform to AWS D1.1 Structural Welding Code.

B. Prefabrication Inspection:

1. Review design and shop detail drawings for size, length, type and location of all welds to be made.
2. Approve welding procedure qualifications either by pre-qualification or by witnessing qualifications tests.
3. Approve welder qualifications by certification or retesting.
4. Approve procedure for control of distortion and shrinkage stresses.
5. Approve procedures for welding in accordance with applicable sections of AWS D1.1.

C. Fabrication and Erection:

1. Weld Inspection:
 - a. Inspect welding equipment for capacity, maintenance and working condition.
 - b. Verify specified electrodes and handling and storage of electrodes in accordance with AWS D1.1.

- c. Inspect preparation and assembly of materials to be welded for conformance with AWS D1.1.
 - d. Inspect preheating and interpass temperatures for conformance with AWS D1.1.
 - e. Measure 25 percent of fillet welds.
 - f. Welding Magnetic Particle Testing: Test in accordance with ASTM E709 for a minimum of:
 - 1) 20 percent of all shear plate fillet welds at random, final pass only.
 - 2) 20 percent of all continuity plate and bracing gusset plate fillet welds, at random, final pass only.
 - 3) 100 percent of tension member fillet welds (i.e., hanger connection plates and other similar connections) for root and final passes.
 - 4) 20 percent of length of built-up column member partial penetration and fillet welds at random for root and final passes.
 - 5) 100 percent of length of built-up girder member partial penetration and fillet welds for root and final passes.
 - g. Welding Ultrasonic Testing: Test in accordance with ASTM E164 and AWS D1.1 for 100 percent of all full penetration welds, braced and moment frame column splices, and a minimum of 20 percent of all other partial penetration column splices, at random.
 - i. Verify that correction of rejected welds are made in accordance with AWS D1.1.
 - j. Testing and inspection do not relieve the Contractor of the responsibility for providing materials and fabrication procedures in compliance with the specified requirements.
2. Bolt Inspection:
- a. Inspect high-strength bolted connections in accordance AISC Specifications for Structural Joints Using ASTM F3125 Bolts.
 - b. Slip-Critical Connections: Inspect 10 percent of bolts, but not less than 2 bolts, selected at random in each connection in accordance with AISC Specifications for

Structural Joints Using ASTM F3125 Bolts. Inspect all bolts in connection when one or more are rejected.

- c. Fully Pre-tensioned Connections: Inspect 10 percent of bolts, but not less than 2 bolts, selected at random in 25 percent of connections in accordance with AISC Specification for Structural Joints Using ASTM F3125 Bolts. Inspect all bolts in connection when one or more are rejected.
 - d. Bolts installed by turn-of-nut tightening may be inspected with calibrated wrench when visual inspection was not performed during tightening.
 - e. Snug Tight Connections: Inspect 10 percent of connections verifying that plies of connected elements have been brought into snug contact.
 - f. Inspect field erected assemblies; verify locations of structural steel for plumbness, level, and alignment.
- D. Submit inspection reports, record of welders and their certification, and identification, and instances of noncompliance to Resident Engineer.

3.16 SHEAR CONNECTOR STUDS:

- A. Provide field inspection and testing services required by AWS D.1 to insure shear connector studs have been installed in accordance with contract documents.
- B. Tests: Test 20 percent of headed studs for fastening strength in accordance with AWS D1.1.
- C. Submit inspection reports, certification, and instances of noncompliance to Resident Engineer.

3.17 SPRAYED-ON FIREPROOFING:

- A. Provide field inspection and testing services to certify sprayed-on fireproofing has been applied in accordance with contract documents.
- B. Obtain a copy of approved submittals from Resident Engineer.
- C. Use approved installation in test areas as criteria for inspection of work.
- D. Test sprayed-on fireproofing for thickness and density in accordance with ASTM E605.
 - 1. Thickness gauge specified in ASTM E605 may be modified for pole extension so that overhead sprayed material can be reached from floor.

E. Location of test areas for field tests as follows:

1. Thickness: Select one bay per floor, or one bay for each 930 m² (10,000 square feet) of floor area, whichever provides for greater number of tests. Take thickness determinations from each of following locations: Metal deck, beam, and column.
2. Density: Take density determinations from each floor, or one test from each 930 m² (10,000 square feet) of floor area, whichever provides for greater number of tests, from each of the following areas: Underside of metal deck, beam flanges, and beam web.

F. Submit inspection reports, certification, and instances of noncompliance to Resident Engineer.

3.18 TYPE OF TEST:

Approximate Number of Tests Required

A. Earthwork:

Laboratory Compaction Test, Soils:

(AASHTO T180)(AASHTO T99)(ASTM D1557)(ASTM D698)

Field Density, Soils (AASHTO T191, T205, or T310)

Penetration Test, Soils

B. Landscaping:

Topsoil Test

C.

D. Asphalt Concrete:

Field Density, (AASHTO T230)

Aggregate, Asphalt Concrete Gradation (AASHTO T27)

Wear (AASHTO T96)

Soundness (AASHTO T104)

E. Concrete:

Making and Curing Concrete Test Cylinders (ASTM C31)	_____
Compressive Strength, Test Cylinders (ASTM C39)	_____
Concrete Slump Test (ASTM C143)	_____
Concrete Air Content Test (ASTM C173)	_____
Unit Weight, Lightweight Concrete (ASTM C567)	_____
Aggregate, Normal Weight: Gradation (ASTM C33)	_____
Deleterious Substances (ASTM C33)	_____
Soundness (ASTM C33)	_____
Abrasion (ASTM C33)	_____
Aggregate, Lightweight Gradation (ASTM C330)	_____
Deleterious Substances (ASTM C330)	_____
Unit Weight (ASTM C330)	_____
Flatness and Levelness Readings (ASTM E1155) (number of days)	_____

F. Reinforcing Steel:

Tensile Test (ASTM A370)	_____
Bend Test (ASTM A370)	_____
Mechanical Splice (ASTM A370)	_____
Welded Splice Test (ASTM A370)	_____

I. Masonry:

Making and Curing Test Cubes (ASTM C109)	_____
Compressive Strength, Test Cubes (ASTM C109)	_____
Sampling and Testing Mortar, Comp. Strength (ASTM C780)	_____
Sampling and Testing Grout, Comp. Strength (ASTM C1019)	_____
Masonry Unit, Compressive Strength (ASTM C140)	_____
Prism Tests (ASTM C1314)	_____

J. Structural Steel:

Ultrasonic Testing of Welds (ASTM E164) _____

Magnetic Particle Testing of Welds (ASTM E709) _____

Radiographic Testing of Welds (ASTM E94) _____

K. Sprayed-On Fireproofing:

Thickness and Density Tests (ASTM E605) _____

--- E N D ---

SECTION 01 57 19
TEMPORARY ENVIRONMENTAL CONTROLS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies the control of environmental pollution and damage that the Contractor must consider for air, water, and land resources. It includes management of visual aesthetics, noise, solid waste, radiant energy, and radioactive materials, as well as other pollutants and resources encountered or generated by the Contractor. The Contractor is obligated to consider specified control measures with the costs included within the various contract items of work.
- B. Environmental pollution and damage is defined as the presence of chemical, physical, or biological elements or agents which:
 - 1. Adversely effect human health or welfare,
 - 2. Unfavorably alter ecological balances of importance to human life,
 - 3. Effect other species of importance to humankind, or;
 - 4. Degrade the utility of the environment for aesthetic, cultural, and historical purposes.
- C. Definitions of Pollutants:
 - 1. Chemical Waste: Petroleum products, bituminous materials, salts, acids, alkalis, herbicides, pesticides, organic chemicals, and inorganic wastes.
 - 2. Debris: Combustible and noncombustible wastes, such as leaves, tree trimmings, ashes, and waste materials resulting from construction or maintenance and repair work.
 - 3. Sediment: Soil and other debris that has been eroded and transported by runoff water.
 - 4. Solid Waste: Rubbish, debris, garbage, and other discarded solid materials resulting from industrial, commercial, and agricultural operations and from community activities.

5. Surface Discharge: The term "Surface Discharge" implies that the water is discharged with possible sheeting action and subsequent soil erosion may occur. Waters that are surface discharged may terminate in drainage ditches, storm sewers, creeks, and/or "water of the United States" and would require a permit to discharge water from the governing agency.
6. Rubbish: Combustible and noncombustible wastes such as paper, boxes, glass and crockery, metal and lumber scrap, tin cans, and bones.
7. Sanitary Wastes:
 - a. Sewage: Domestic sanitary sewage and human and animal waste.
 - b. Garbage: Refuse and scraps resulting from preparation, cooking, dispensing, and consumption of food.

1.2 QUALITY CONTROL

- A. Establish and maintain quality control for the environmental protection of all items set forth herein.
- B. Record on daily reports any problems in complying with laws, regulations, and ordinances. Note any corrective action taken.

1.3 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 basic designation only.
- B. U.S. National Archives and Records Administration (NARA):
33 CFR 328Definitions

1.4 SUBMITTALS

- A. In accordance with Section, 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES, furnish the following:
 1. Environmental Protection Plan: After the contract is awarded and prior to the commencement of the work, the Contractor shall meet with the Contracting Officer Representative (COR) to discuss the proposed Environmental Protection Plan and to develop mutual understanding relative to details of environmental protection. Not more than 20 days after the meeting, the Contractor shall prepare and submit to the

COR for approval, a written and/or graphic Environmental Protection Plan including, but not limited to, the following:

- a. Name(s) of person(s) within the Contractor's organization who is (are) responsible for ensuring adherence to the Environmental Protection Plan.
- b. Name(s) and qualifications of person(s) responsible for manifesting hazardous waste to be removed from the site.
- c. Name(s) and qualifications of person(s) responsible for training the Contractor's environmental protection personnel.
- d. Description of the Contractor's environmental protection personnel training program.
- e. A list of Federal, State, and local laws, regulations, and permits concerning environmental protection, pollution control, noise control and abatement that are applicable to the Contractor's proposed operations and the requirements imposed by those laws, regulations, and permits.
- f. Methods for protection of features to be preserved within authorized work areas including trees, shrubs, vines, grasses, ground cover, landscape features, air and water quality, fish and wildlife, soil, historical, and archeological and cultural resources.
- g. Procedures to provide the environmental protection that comply with the applicable laws and regulations. Describe the procedures to correct pollution of the environment due to accident, natural causes, or failure to follow the procedures as described in the Environmental Protection Plan.
- h. Permits, licenses, and the location of the solid waste disposal area.
- i. Drawings showing locations of any proposed temporary excavations or embankments for haul roads, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials. Include as part of an Erosion Control Plan approved by the District Office of the U.S. Soil Conservation Service and the Department of Veterans Affairs.

- j. Environmental Monitoring Plans for the job site including land, water, air, and noise.
 - k. Work Area Plan showing the proposed activity in each portion of the area and identifying the areas of limited use or nonuse. Plan should include measures for marking the limits of use areas. This plan may be incorporated within the Erosion Control Plan.
- B. Approval of the Contractor's Environmental Protection Plan will not relieve the Contractor of responsibility for adequate and continued control of pollutants and other environmental protection measures.

1.5 PROTECTION OF ENVIRONMENTAL RESOURCES

- A. Protect environmental resources within the project boundaries and those affected outside the limits of permanent work during the entire period of this contract. Confine activities to areas defined by the specifications and drawings.
- B. Protection of Land Resources: Prior to construction, identify all land resources to be preserved within the work area. Do not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, top soil, and land forms without permission from the COR. Do not fasten or attach ropes, cables, or guys to trees for anchorage unless specifically authorized, or where special emergency use is permitted.
 - 1. Work Area Limits: Prior to any construction, mark the areas that require work to be performed under this contract. Mark or fence isolated areas within the general work area that are to be saved and protected. Protect monuments, works of art, and markers before construction operations begin. Convey to all personnel the purpose of marking and protecting all necessary objects.
 - 2. Protection of Landscape: Protect trees, shrubs, vines, grasses, land forms, and other landscape features shown on the drawings to be preserved by marking, fencing, or using any other approved techniques.
 - a. Box and protect from damage existing trees and shrubs to remain on the construction site.

- b. Immediately repair all damage to existing trees and shrubs by trimming, cleaning, and painting with antiseptic tree paint.
 - c. Do not store building materials or perform construction activities closer to existing trees or shrubs than the farthest extension of their limbs.
- 3. Reduction of Exposure of Unprotected Erodible Soils: Plan and conduct earthwork to minimize the duration of exposure of unprotected soils. Clear areas in reasonably sized increments only as needed to use. Form earthwork to final grade as shown. Immediately protect side slopes and back slopes upon completion of rough grading.
- 4. Temporary Protection of Disturbed Areas: Construct diversion ditches, benches, and berms to retard and divert runoff from the construction site to protected drainage areas approved under paragraph 208 of the Clean Water Act.
 - a. Sediment Basins: Trap sediment from construction areas in temporary or permanent sediment basins that accommodate the runoff of a local 2021 (design year) storm. After each storm, pump the basins dry and remove the accumulated sediment. Control overflow/drainage with paved weirs or by vertical overflow pipes, draining from the surface.
 - b. Reuse or conserve the collected topsoil sediment as directed by the COR. Topsoil use and requirements are specified in Section 31 20 00, EARTH MOVING.
 - c. Institute effluent quality monitoring programs as required by Federal, State, and local environmental agencies.
- 5. Erosion and Sedimentation Control Devices: The erosion and sediment controls selected and maintained by the Contractor shall be such that water quality standards are not violated as a result of the Contractor's activities. Construct or install all temporary and permanent erosion and sedimentation control features. Maintain temporary erosion and sediment control measures such as berms, dikes, drains, sedimentation basins, grassing, and mulching, until permanent drainage and erosion control facilities are completed and operative.
- 6. Manage borrow areas on Government property to minimize erosion and to prevent sediment from entering nearby water courses or lakes.

7. Manage and control spoil areas on Government property to limit spoil to areas and prevent erosion of soil or sediment from entering nearby water courses or lakes.
 8. Protect adjacent areas from despoilment by temporary excavations and embankments.
 9. Handle and dispose of solid wastes in such a manner that will prevent contamination of the environment. Place solid wastes (excluding clearing debris) in containers that are emptied on a regular schedule. Transport all solid waste off Government property and dispose of waste in compliance with Federal, State, and local requirements.
 10. Store chemical waste away from the work areas in corrosion resistant containers and dispose of waste in accordance with Federal, State, and local regulations.
 11. Handle discarded materials other than those included in the solid waste category as directed by the COR.
- C. Protection of Water Resources: Keep construction activities under surveillance, management, and control to avoid pollution of surface and ground waters and sewer systems. Implement management techniques to control water pollution by the listed construction activities that are included in this contract.
1. Washing and Curing Water: Do not allow wastewater directly derived from construction activities to enter water areas. Collect and place wastewater in retention ponds allowing the suspended material to settle, the pollutants to separate, or the water to evaporate.
 2. Control movement of materials and equipment at stream crossings during construction to prevent violation of water pollution control standards of the Federal, State, or local government.
 3. Monitor water areas affected by construction.
- D. Protection of Fish and Wildlife Resources: Keep construction activities under surveillance, management, and control to minimize interference with, disturbance of, or damage to fish and wildlife. Prior to beginning construction operations, list species that require specific attention along with measures for their protection.

- E. Protection of Air Resources: Keep construction activities under surveillance, management, and control to minimize pollution of air resources. Burning is not permitted on the job site. Keep activities, equipment, processes, and work operated or performed, in strict accordance with the State of Idaho State Air Pollution Agency and Federal emission and performance laws and standards. Maintain ambient air quality standards set by the Environmental Protection Agency, for those construction operations and activities specified.
1. Particulates: Control dust particles, aerosols, and gaseous by-products from all construction activities, processing, and preparation of materials (such as from asphaltic batch plants) at all times, including weekends, holidays, and hours when work is not in progress.
 2. Particulates Control: Maintain all excavations, stockpiles, haul roads, permanent and temporary access roads, plant sites, spoil areas, borrow areas, and all other work areas within or outside the project boundaries free from particulates which would cause a hazard or a nuisance. Sprinklering, chemical treatment of an approved type, light bituminous treatment, baghouse, scrubbers, electrostatic precipitators, or other methods are permitted to control particulates in the work area.
 3. Hydrocarbons and Carbon Monoxide: Control monoxide emissions from equipment to Federal and State allowable limits.
 4. Odors: Control odors of construction activities and prevent obnoxious odors from occurring.
- F. Reduction of Noise: Minimize noise using every action possible. Perform noise-producing work in less sensitive hours of the day or week as directed by the COR. Maintain noise-produced work at or below the decibel levels and within the time periods specified.
1. Perform construction activities involving repetitive, high-level impact noise only between 8:00 a.m. and 6:00p.m unless otherwise permitted by local ordinance or the COR. Repetitive impact noise on the property shall not exceed the following dB limitations:

Time Duration of Impact Noise	Sound Level in dB
More than 12 minutes in any hour	70
Less than 30 seconds of any hour	85
Less than three minutes of any hour	80
Less than 12 minutes of any hour	75

2. Provide sound-deadening devices on equipment and take noise abatement measures that are necessary to comply with the requirements of this contract, consisting of, but not limited to, the following:
 - a. Maintain maximum permissible construction equipment noise levels at 15 m (50 feet) (dBA):

EARTHMOVING		MATERIALS HANDLING	
FRONT LOADERS	75	CONCRETE MIXERS	75
BACKHOES	75	CONCRETE PUMPS	75
DOZERS	75	CRANES	75
TRACTORS	75	DERRICKS IMPACT	75
SCAPERS	80	PILE DRIVERS	95
GRADERS	75	JACK HAMMERS	75
TRUCKS	75	ROCK DRILLS	80
PAVERS, STATIONARY	80	PNEUMATIC TOOLS	80
PUMPS	75	BLASTING	
GENERATORS	75	SAWS	75
COMPRESSORS	75	VIBRATORS	75

- b. Use shields or other physical barriers to restrict noise transmission.
 - c. Provide soundproof housings or enclosures for noise-producing machinery.
 - d. Use efficient silencers on equipment air intakes.
 - e. Use efficient intake and exhaust mufflers on internal combustion engines that are maintained so equipment performs below noise levels specified.

- f. Line hoppers and storage bins with sound deadening material.
 - g. Conduct truck loading, unloading, and hauling operations so that noise is kept to a minimum.
- 3. Measure sound level for noise exposure due to the construction at least once every five successive working days while work is being performed above 55 dB(A) noise level. Measure noise exposure at the property line or 15 m (50 feet) from the noise source, whichever is greater. Measure the sound levels on the A weighing network of a General Purpose sound level meter at slow response. To minimize the effect of reflective sound waves at buildings, take measurements at 900 to 1800 mm (three to six feet) in front of any building face. Submit the recorded information to the COR noting any problems and the alternatives for mitigating actions.
- G. Restoration of Damaged Property: If any direct or indirect damage is done to public or private property resulting from any act, omission, neglect, or misconduct, the Contractor shall restore the damaged property to a condition equal to that existing before the damage at no additional cost to the Government. Repair, rebuild, or restore property as directed or make good such damage in an acceptable manner.
- H. Final Clean-up: On completion of project and after removal of all debris, rubbish, and temporary construction, Contractor shall leave the construction area in a clean condition satisfactory to the COR. Cleaning shall include off the station disposal of all items and materials not required to be salvaged, as well as all debris and rubbish resulting from demolition and new work operations.

--- E N D ---

SECTION 01 74 19
CONSTRUCTION WASTE MANAGEMENT

PART 1 – GENERAL

1.1 DESCRIPTION

- A. This section specifies the requirements for the management of non-hazardous building construction and demolition waste.
- B. Waste disposal in landfills shall be minimized to the greatest extent possible. Of the inevitable waste that is generated, as much of the waste material as economically feasible shall be salvaged, recycled or reused.
- C. Contractor shall use all reasonable means to divert construction and demolition waste from landfills and incinerators, and facilitate their salvage and recycle not limited to the following:
 - 1. Waste Management Plan development and implementation.
 - 2. Techniques to minimize waste generation.
 - 3. Sorting and separating of waste materials.
 - 4. Salvage of existing materials and items for reuse or resale.
 - 5. Recycling of materials that cannot be reused or sold.
- D. At a minimum the following waste categories shall be diverted from landfills:
 - 1. Soil.
 - 2. Inerts (eg, concrete, masonry and asphalt).
 - 3. Clean dimensional wood and palette wood.
 - 4. Green waste (biodegradable landscaping materials).
 - 5. Engineered wood products (plywood, particle board and I-joists, etc).
 - 6. Metal products (eg, steel, wire, beverage containers, copper, etc).
 - 7. Cardboard, paper and packaging.
 - 8. Bitumen roofing materials.
 - 9. Plastics (eg, ABS, PVC).
 - 10. Carpet and/or pad.
 - 11. Gypsum board.

12. Insulation.
13. Paint.
14. Fluorescent lamps.

1.2 RELATED WORK

- A. Section 02 41 00, DEMOLITION.
- B. Section 01 00 00, GENERAL REQUIREMENTS.
- C. Lead Paint: Section 02 83 33.13, LEAD BASED PAINT REMOVAL AND DISPOSAL.

1.3 QUALITY ASSURANCE

- A. Contractor shall practice efficient waste management when sizing, cutting and installing building products. Processes shall be employed to ensure the generation of as little waste as possible. Construction /Demolition waste includes products of the following:
 1. Excess or unusable construction materials.
 2. Packaging used for construction products.
 3. Poor planning and/or layout.
 4. Construction error.
 5. Over ordering.
 6. Weather damage.
 7. Contamination.
 8. Mishandling.
 9. Breakage.
- B. Establish and maintain the management of non-hazardous building construction and demolition waste set forth herein. Conduct a site assessment to estimate the types of materials that will be generated by demolition and construction.
- C. Contractor shall develop and implement procedures to recycle construction and demolition waste to a minimum of 50 percent.
- D. Contractor shall be responsible for implementation of any special programs involving rebates or similar incentives related to recycling. Any revenues or savings obtained from salvage or recycling shall accrue to the contractor.

- E. Contractor shall provide all demolition, removal and legal disposal of materials.
Contractor shall ensure that facilities used for recycling, reuse and disposal shall be permitted for the intended use to the extent required by local, state, federal regulations. The Whole Building Design Guide website <http://www.wbdg.org/tools/cwm.php> provides a Construction Waste Management Database that contains information on companies that haul, collect, and process recyclable debris from construction projects.
- F. Contractor shall assign a specific area to facilitate separation of materials for reuse, salvage, recycling, and return. Such areas are to be kept neat and clean and clearly marked in order to avoid contamination or mixing of materials.
- G. Contractor shall provide on-site instructions and supervision of separation, handling, salvaging, recycling, reuse and return methods to be used by all parties during waste generating stages.
- H. Record on daily reports any problems in complying with laws, regulations and ordinances with corrective action taken.

1.4 TERMINOLOGY

- A. Class III Landfill: A landfill that accepts non-hazardous resources such as household, commercial and industrial waste resulting from construction, remodeling, repair and demolition operations.
- B. Clean: Untreated and unpainted; uncontaminated with adhesives, oils, solvents, mastics and like products.
- C. Construction and Demolition Waste: Includes all non-hazardous resources resulting from construction, remodeling, alterations, repair and demolition operations.
- D. Dismantle: The process of parting out a building in such a way as to preserve the usefulness of its materials and components.
- E. Disposal: Acceptance of solid wastes at a legally operating facility for the purpose of land filling (includes Class III landfills and inert fills).

- F. Inert Backfill Site: A location, other than inert fill or other disposal facility, to which inert materials are taken for the purpose of filling an excavation, shoring or other soil engineering operation.
- G. Inert Fill: A facility that can legally accept inert waste, such as asphalt and concrete exclusively for the purpose of disposal.
- H. Inert Solids/Inert Waste: Non-liquid solid resources including, but not limited to, soil and concrete that does not contain hazardous waste or soluble pollutants at concentrations in excess of water-quality objectives established by a regional water board, and does not contain significant quantities of decomposable solid resources.
- I. Mixed Debris: Loads that include commingled recyclable and non-recyclable materials generated at the construction site.
- J. Mixed Debris Recycling Facility: A solid resource processing facility that accepts loads of mixed construction and demolition debris for the purpose of recovering re-usable and recyclable materials and disposing non-recyclable materials.
- K. Permitted Waste Hauler: A company that holds a valid permit to collect and transport solid wastes from individuals or businesses for the purpose of recycling or disposal.
- L. Recycling: The process of sorting, cleansing, treating, and reconstituting materials for the purpose of using the altered form in the manufacture of a new product. Recycling does not include burning, incinerating or thermally destroying solid waste.
 - 1. On-site Recycling – Materials that are sorted and processed on site for use in an altered state in the work, i.e. concrete crushed for use as a sub-base in paving.
 - 2. Off-site Recycling – Materials hauled to a location and used in an altered form in the manufacture of new products.
- M. Recycling Facility: An operation that can legally accept materials for the purpose of processing the materials into an altered form for the manufacture of new products. Depending on the types of materials accepted and operating procedures, a recycling facility may or may not be required to have a solid waste facilities permit or be regulated by the local enforcement agency.
- N. Reuse: Materials that are recovered for use in the same form, on-site or off-site.

- O. Return: To give back reusable items or unused products to vendors for credit.
- P. Salvage: To remove waste materials from the site for resale or re-use by a third party.
- Q. Source-Separated Materials: Materials that are sorted by type at the site for the purpose of reuse and recycling.
- R. Solid Waste: Materials that have been designated as non-recyclable and are discarded for the purposes of disposal.
- S. Transfer Station: A facility that can legally accept solid waste for the purpose of temporarily storing the materials for re-loading onto other trucks and transporting them to a landfill for disposal, or recovering some materials for re-use or recycling.

1.5 SUBMITTALS

- A. In accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, and SAMPLES, furnish the following:
- B. Prepare and submit to the Contracting Officer Representative (COR) a written demolition debris management plan. The plan shall include, but not be limited to, the following information:
 - 1. Procedures to be used for debris management.
 - 2. Techniques to be used to minimize waste generation.
 - 3. Analysis of the estimated job site waste to be generated:
 - a. List of each material and quantity to be salvaged, reused, recycled.
 - b. List of each material and quantity proposed to be taken to a landfill.
 - 4. Detailed description of the Means/Methods to be used for material handling.
 - a. On site: Material separation, storage, protection where applicable.
 - b. Off site: Transportation means and destination. Include list of materials.
 - 1) Description of materials to be site-separated and self-hauled to designated facilities.
 - 2) Description of mixed materials to be collected by designated waste haulers and removed from the site.
 - c. The names and locations of mixed debris reuse and recycling facilities or sites.
 - d. The names and locations of trash disposal landfill facilities or sites.

- e. Documentation that the facilities or sites are approved to receive the materials.
- C. Designated Manager responsible for instructing personnel, supervising, documenting and administer over meetings relevant to the Waste Management Plan.
- D. Monthly summary of construction and demolition debris diversion and disposal, quantifying all materials generated at the work site and disposed of or diverted from disposal through recycling.

1.6 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced by the basic designation only. In the event that criteria requirements conflict, the most stringent requirements shall be met.
- B. U.S. Green Building Council (USGBC):
LEED Green Building Rating System for New Construction

1.7 RECORDS

Maintain records to document the quantity of waste generated; the quantity of waste diverted through sale, reuse, or recycling; and the quantity of waste disposed by landfill or incineration. Records shall be kept in accordance with the LEED Reference Guide and LEED Template.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. List of each material and quantity to be salvaged, recycled, reused.
- B. List of each material and quantity proposed to be taken to a landfill.
- C. Material tracking data: Receiving parties, dates removed, transportation costs, weight tickets, tipping fees, manifests, invoices, net total costs or savings.

PART 3 - EXECUTION

3.1 COLLECTION

- A. Provide all necessary containers, bins and storage areas to facilitate effective waste management.

- B. Clearly identify containers, bins and storage areas so that recyclable materials are separated from trash and can be transported to respective recycling facility for processing.
- C. Hazardous wastes shall be separated, stored, disposed of according to local, state, federal regulations.

3.2 DISPOSAL

- A. Contractor shall be responsible for transporting and disposing of materials that cannot be delivered to a source-separated or mixed materials recycling facility to a transfer station or disposal facility that can accept the materials in accordance with state and federal regulations.
- B. Construction or demolition materials with no practical reuse or that cannot be salvaged or recycled shall be disposed of at a landfill or incinerator.

3.3 REPORT

- A. With each application for progress payment, submit a summary of construction and demolition debris diversion and disposal including beginning and ending dates of period covered.
- B. Quantify all materials diverted from landfill disposal through salvage or recycling during the period with the receiving parties, dates removed, transportation costs, weight tickets, manifests, invoices. Include the net total costs or savings for each salvaged or recycled material.
- C. Quantify all materials disposed of during the period with the receiving parties, dates removed, transportation costs, weight tickets, tipping fees, manifests, invoices. Include the net total costs for each disposal.

--- E N D ---

SECTION 01 81 13
SUSTAINABLE CONSTRUCTION REQUIREMENTS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This Section describes general requirements and procedures to comply with federal mandates and U.S. Department of Veterans Affairs (VA) policies for sustainable construction.
- B. The Design Professional has selected materials and utilized integrated design processes that achieve the Government's objectives. Contractor is responsible to maintain and support these objectives in developing means and methods for performing work and in proposing product substitutions or changes to specified processes. Obtain approval from Contracting Officer for all changes and substitutions to materials or processes. Proposed changes must meet, or exceed, materials or processes specified.

1.2 RELATED WORK

- A. Section 01 57 19 TEMPORARY ENVIRONMENTAL CONTROLS.
- B. Section 01 74 19 CONSTRUCTION WASTE MANAGEMENT.
- C. Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS.

1.3 DEFINITIONS

- A. Recycled Content: Recycled content of materials is defined according to Federal Trade Commission Guides for the Use of Environmental Marketing Claims (16 CFR Part 260). Recycled content value of a material assembly is determined by weight. Recycled fraction of assembly is multiplied by cost of assembly to determine recycled content value.
 - 1. "Post-Consumer" material is defined as waste material generated by households or by commercial, industrial, and institutional facilities in their role as end users of the product, which can no longer be used for its intended purpose.
 - 2. "Pre-Consumer" material is defined as material diverted from waste stream during the manufacturing process. Excluded is reutilization of materials such as rework,

regrind, or scrap generated in a process and capable of being reclaimed within the same process that generated it.

- B. Biobased Products: Biobased products are derived from plants and other renewable agricultural, marine, and forestry materials and provide an alternative to conventional petroleum derived products. Biobased products include diverse categories such as lubricants, cleaning products, inks, fertilizers, and bioplastics.
- C. Low Pollutant-Emitting Materials: Materials and products which are minimally odorous, irritating, or harmful to comfort and well-being of installers and occupants.
- D. Volatile Organic Compounds (VOC): Chemicals that are emitted as gases from certain solids or liquids. VOCs include a variety of chemicals, some of which may have short- and long-term adverse health effects.

1.4 REFERENCE STANDARDS

- A. Carpet and Rug Institute Green Label Plus program.
- B. U.S. Department of Agriculture BioPreferred program (USDA BioPreferred).
- C. U.S. Environmental Protection Agency Comprehensive Procurement Guidelines (CPG).
- D. U.S. Environmental Protection Agency WaterSense Program (WaterSense).
- E. U.S. Environmental Protection Agency ENERGY STAR Program (ENERGY STAR).
- F. U. S. Department of Energy Federal Energy Management Program (FEMP).
- G. Green Electronic Council EPEAT Program (EPEAT).

1.5 SUBMITTALS

- A. All submittals to be provided by contractor to COR.
- B. Sustainability Action Plan:
 - 1. Submit documentation as required by this section; provide additional copies of typical submittals required under technical sections when sustainable construction requires copies of record submittals.
 - 2. Within 30 days after Preconstruction Meeting provide a narrative plan for complying with requirements stipulated within this section.
 - 3. Sustainability Action Plan must:

- a. Make reference to sustainable construction submittals defined by this section.
 - b. Address all items listed under PERFORMANCE CRITERIA.
 - c. Indicate individual(s) responsible for implementing the plan.
- C. Low Pollutant-Emitting Materials Tracking Spreadsheet: Within 30 days after Preconstruction Meeting provide a preliminary Low Pollutant-Emitting Materials Tracking Spreadsheet. The Low Pollutant-Emitting Materials Tracking Spreadsheet must be an electronic file and include all materials on Project in categories described under Low Pollutant-Emitting Materials in 01 81 13.
- D. Construction Indoor Air Quality (IAQ) Management Plan:
 - 1. Not more than 30 days after Preconstruction Meeting provide a Construction IAQ Management Plan as an electronic file including descriptions of the following:
 - a. Instruction procedures for meeting or exceeding minimum requirements of ANSI/SMACNA 008-2008, Chapter 3, including procedures for HVAC Protection, Source Control, Pathway Interruption, Housekeeping, and Scheduling.
 - b. Instruction procedures for protecting absorptive materials stored on-site or installed from moisture damage.
 - c. Schedule of submission of photographs of on-site construction IAQ management measures such as protection of ducts and on-site stored oil installed absorptive materials.
 - d. Instruction procedures if air handlers must be used during construction, including a description of filtration media to be used at each return air grille.
 - e. Instruction procedure for replacing all air-filtration media immediately prior to occupancy after completion of construction, including a description of filtration media to be used at each air handling or air supply unit.
 - f. Instruction procedures and schedule for implementing building flush-out.
- E. Product Submittals:
 - 1. Recycled Content: Submit product data from manufacturer indicating percentages by weight of post-consumer and pre-consumer recycled content for products having recycled content (excluding MEP systems equipment and components).

2. Biobased Content: Submit product data for products to be installed or used which are included in any of the USDA BioPreferred program's product categories. Data to include percentage of biobased content and source of biobased material.
 3. Low Pollutant-Emitting Materials: Submit product data confirming compliance with relevant requirements for all materials on Project in categories described under Low Pollutant-Emitting Materials in 01 81 13.
 4. For applicable products and equipment, submit product documentation confirming ENERGY STAR label, FEMP certification, WaterSense, and/or EPEAT certification.
- F. Sustainable Construction Progress Reports: Concurrent with each Application for Payment, submit a Sustainable Construction Progress Report to confirm adherence with Sustainability Action Plan.
1. Include narratives of revised strategies for bringing work progress into compliance with plan and product submittal data.
 2. Include updated and current Low Pollutant-Emitting Materials Tracking Spreadsheet.
 3. Include construction waste tracking, in tons or cubic yards, including waste description, whether diverted or landfilled, hauler, and percent diverted for comingled quantities; and excluding land-clearing debris and soil. Provide haul receipts and documentation of diverted percentages for comingled wastes.
- G. Closeout Submittals: Within 14 days after Substantial Completion provide the following:
1. Final version of Low Pollutant-Emitting Materials Tracking Spreadsheet.
 2. Manufacturer's cut sheets and product data highlighting the Minimum Efficiency Reporting Value (MERV) for filtration media installed at return air grilles during construction if permanently installed air handling units are used during construction.
 3. Manufacturer's cut sheets and product data highlighting the Minimum Efficiency Reporting Value (MERV) for final filtration media in air handling units.
 4. Minimum 18 construction photographs including six photographs taken on three different occasions during construction of ANSI/SMACNA 008-2008, Chapter 3 approaches employed, along with a brief description of each approach, documenting

implementation of IAQ management measures, such as protection of ducts and on-site stored or installed absorptive materials.

5. Flush-out Documentation:

- a. Product data for filtration media used during flush-out.
- b. Product data for filtration media installed immediately prior to occupancy.
- c. Signed statement describing building air flush-out procedures including dates when flush-out was begun and completed and statement that filtration media was replaced after flush-out.

1.6 QUALITY ASSURANCE

- A. Preconstruction Meeting: After award of Contract and prior to commencement of Work, schedule and conduct meeting with COR/Resident Engineer and Architect to discuss the Project Sustainable Action Plan content as it applies to submittals, project delivery, required Construction Indoor Air Quality (IAQ) Management Plan, and other Sustainable Construction Requirements. The purpose of this meeting is to develop a mutual understanding of the Sustainable Construction Requirements and coordination of contractor's management of these requirements with the Contracting Officer and the Construction Quality Manager.
- B. Construction Job Conferences: Status of compliance with Sustainable Construction Requirements of these specifications will be an agenda item at regular job meetings conducted during the course of work at the site.

1.7 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only. Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
- B. Green Seal Standard GS-11, Paints, 1st Edition, May 20, 1993.
- C. Green Seal Standard GC-03, Anti-Corrosive Paints, 2nd Edition, January 7, 1997.
- D. Green Seal Standard GC-36, Commercial Adhesives, October 19, 2000.

- E. South Coast Air Quality Management District (SCAQMD) Rule 1113, Architectural Coatings, rules in effect on January 1, 2004.
- F. South Coast Air Quality Management District (SCAQMD) Rule 1168, July 1, 2005 and rule amendment date of January 7, 2005.
- G. Sheet Metal and Air Conditioning National Contractors' Association (SMACNA) IAQ Guidelines for Occupied Buildings under Construction, 2nd Edition (ANSI/SMACNA 008-2008), Chapter 3.
- H. California Department of Public Health Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers, Version 1.1, Emission Testing method for California Specification 01350 (CDPH Standard Method V1.1-2010).
- I. Federal Trade Commission Guides for the Use of Environmental Marketing Claims (16 CFR Part 260).
- J. ASHRAE Standard 52.2-2007.

PART 2 – PRODUCTS

2.1 PERFORMANCE CRITERIA

- A. Construction waste diversion from landfill disposal must comprise at least 50 percent of total construction waste, excluding land clearing debris and soil. Alternative daily cover (ADC) does not qualify as material diverted from disposal.
- B. Low Pollutant-Emitting Materials:
 - 1. Adhesives, sealants and sealant primers applied on site within the weatherproofing membrane must comply with VOC limits of SCAQMD Rule 1168:
 - a. Flooring Adhesives and Sealants:
 - 1) Indoor carpet adhesives: 50 g/L.
 - 2) Wood Flooring Adhesive: 100 g/L.
 - 3) Rubber Floor Adhesives: 60 g/L.
 - 4) Subfloor Adhesives: 50 g/L.
 - 5) Ceramic Tile Adhesives and Grout: 65 g/L.
 - 6) Cove Base Adhesives: 50 g/L.

- 7) Multipurpose Construction Adhesives: 70 g/L.
 - 8) Porous Material (Except Wood) Substrate: 50 g/L.
 - 9) Wood Substrate: 30 g/L.
 - 10) Architectural Non-Porous Sealant Primer: 250 g/L.
 - 11) Architectural Porous Sealant Primer: 775 g/L.
 - 12) Other Sealant Primer: 750 g/L.
 - 13) Structural Wood Member Adhesive: 140 g/L.
 - 14) Sheet-Applied Rubber Lining Operations: 850 g/L.
 - 15) Top and Trim Adhesive: 250 g/L.
 - 16) Architectural Sealant: 250 g/L.
 - 17) Other Sealant: 420 g/L.
- b. Non-Flooring Adhesives and Sealants:
- 1) Drywall and Panel Adhesives: 50 g/L.
 - 2) Multipurpose Construction Adhesives: 70 g/L.
 - 3) Structural Glazing Adhesives: 100 g/L.
 - 4) Metal-to-Metal Substrate Adhesives: 30 g/L.
 - 5) Plastic Foam Substrate Adhesive: 50 g/L.
 - 6) Porous Material (Except Wood) Substrate Adhesive: 50 g/L.
 - 7) Wood Substrate Adhesive: 30 g/L.
 - 8) Fiberglass Substrate Adhesive: 80 g/L.
 - 9) Architectural Non-Porous Sealant Primer: 250 g/L.
 - 10) Architectural Porous Sealant Primer: 775 g/L.
 - 11) Other Sealant Primer: 750 g/L.
 - 12) PVC Welding Adhesives: 510 g/L.
 - 13) CPVC Welding Adhesives: 490 g/L.
 - 14) ABS Welding Adhesives: 325 g/L.
 - 15) Plastic Cement Welding Adhesives: 250 g/L.
 - 16) Adhesive Primer for Plastic: 550 g/L.
 - 17) Contact Adhesive: 80 g/L.

- 18) Special Purpose Contact Adhesive: 250 g/L.
 - 19) Structural Wood Member Adhesive: 140 g/L.
 - 20) Sheet Applied Rubber Lining Operations: 850 g/L.
 - 21) Top and Trim Adhesive: 250 g/L.
 - 22) Architectural Sealants: 250 g/L.
 - 23) Other Sealants: 420 g/L.
2. Aerosol adhesives applied on site within the weatherproofing membrane must comply with the following Green Seal GS-36.
 - a. Aerosol Adhesive, General-Purpose Mist Spray: 65 percent VOCs by weight.
 - b. Aerosol Adhesive, General-Purpose Web Spray: 55 percent VOCs by weight.
 - c. Special-Purpose Aerosol Adhesive (All Types): 70 percent VOCs by weight.
 3. Paints and coatings applied on site within the weatherproofing membrane must comply with the following criteria:
 - a. VOC content limits for paints and coatings established in Green Seal Standard GS-11.
 - b. VOC content limit for anti-corrosive and anti-rust paints applied to interior ferrous metal substrates of 250 g/L established in Green Seal GC-03.
 - c. Clear wood finishes, floor coatings, stains, primers, sealers, and shellacs applied to interior elements must not exceed VOC content limits established in SCAQMD Rule 1113.
 - d. Comply with the following VOC content limits:
 - 1) Anti-Corrosive/Antirust Paints: 250 g/L.
 - 2) Clear Wood Finish, Lacquer: 550 g/L.
 - 3) Clear Wood Finish, Sanding Sealer: 350 g/L.
 - 4) Clear Wood Finish, Varnish: 350 g/L.
 - 5) Floor Coating: 100 g/L.
 - 6) Interior Flat Paint, Coating or Primer: 50 g/L.
 - 7) Interior Non-Flat Paint, Coating or Primer: 150 g/L.
 - 8) Sealers and Undercoaters: 200 g/L.

- 9) Shellac, Clear: 730 g/L.
 - 10) Shellac, Pigmented: 550 g/L.
 - 11) Stain: 250 g/L.
 - 12) Clear Brushing Lacquer: 680 g/L.
 - 13) Concrete Curing Compounds: 350 g/L.
 - 14) Japans/Faux Finishing Coatings: 350 g/L.
 - 15) Magnesite Cement Coatings: 450 g/L.
 - 16) Pigmented Lacquer: 550 g/L.
 - 17) Waterproofing Sealers: 250 g/L.
 - 18) Wood Preservatives: 350 g/L.
 - 19) Low-Solids Coatings: 120 g/L.
- 4. Carpet installed in building interior must comply with one of the following:
 - a. Meet testing and product requirements of the Carpet and Rug Institute Green Label Plus program.
 - b. Maximum VOC concentrations specified in CDPH Standard Method V1.1-2010, using office scenario at the 14 day time point.
 - 5. Each non-carpet flooring element installed in building interior which is not inherently non-emitting (stone, ceramic, powder-coated metals, plated or anodized metal, glass, concrete, clay brick, and unfinished or untreated solid wood flooring) must comply with one of the following:
 - a. Meet requirements of the FloorScore standard as shown with testing by an independent third-party.
 - b. Maximum VOC concentrations specified in CDPH Standard Method V1.1-2010, using office scenario at 14 day time point.
 - 6. Composite wood and agrifiber products used within the weatherproofing membrane must contain no added urea-formaldehyde resins.
 - 7. Laminating adhesives used to fabricate on-site and shop-applied composite wood and agrifiber assemblies must not contain added urea-formaldehyde.
- C. Recycled Content:

1. Any products being installed or used that are listed on EPA Comprehensive Procurement Guidelines designated product list must meet or exceed the EPA's recycled content recommendations. The EPA Comprehensive Procurement Guidelines categories include:
 - a. Building insulation.
 - b. Cement and concrete.
 - c. Consolidated and reprocessed latex paint.
 - d. Floor tiles.
 - e. Flowable fill.
 - f. Laminated paperboard.
 - g. Modular threshold ramps.
 - h. Nonpressure pipe.
 - i. Patio blocks.
 - j. Railroad grade crossing surfaces.
 - k. Roofing materials.
 - l. Shower and restroom dividers/partitions.
 - m. Structural fiberboard.
 - n. Nylon carpet and nylon carpet backing.
 - o. Compost and fertilizer made from recovered organic materials.
 - p. Hydraulic mulch.
 - q. Lawn and garden edging.
 - r. Plastic lumber landscaping timbers and posts.
 - s. Park benches and picnic tables.
 - t. Plastic fencing.
 - u. Playground equipment.
 - v. Playground surfaces.
 - w. Bike racks.

D. Biobased Content:

1. Materials and equipment being installed or used that are listed on the USDA BioPreferred program product category list must meet or exceed USDA's minimum biobased content threshold. Refer to individual specification sections for detailed requirements applicable to that section.
 - a. USDA BioPreferred program categories include:
 - 1) Adhesive and Mastic Removers.
 - 2) Carpets.
 - 3) Cleaners.
 - 4) Composite Panels.
 - 5) Corrosion Preventatives.
 - 6) Erosion Control Materials.
 - 7) Dust Suppressants.
 - 8) Fertilizers.
 - 9) Floor Cleaners and Protectors.
 - 10) Floor Coverings (Non-Carpet).
 - 11) Glass Cleaners.
 - 12) Hydraulic Fluids.
 - 13) Industrial Cleaners.
 - 14) Interior Paints and Coatings.
 - 15) Mulch and Compost Materials.
 - 16) Multipurpose Cleaners.
 - 17) Multipurpose Lubricants.
 - 18) Packaging Films.
 - 19) Paint Removers.
 - 20) Plastic Insulating Foam.
 - 21) Pneumatic Equipment Lubricants.
 - 22) Roof Coatings.
 - 23) Wastewater Systems Coatings.
 - 24) Water Tank Coatings.

25) Wood and Concrete Sealers.

26) Wood and Concrete Stains.

E. Materials, products, and equipment being installed which fall into a category covered by the WaterSense program must be WaterSense-labeled or meet or exceed WaterSense program performance requirements, unless disallowed for infection control reasons.

1. WaterSense categories include:

- a. Bathroom Faucets
- b. Commercial Toilets
- c. Irrigation Controllers
- d. Pre-Rinse Spray Valves
- e. Residential Toilets
- f. Showerheads
- g. Spray Sprinkler Bodies
- h. Urinals

F. Materials, products, and equipment being installed which fall into any of the following product categories must be Energy Star-labeled.

1. Applicable Energy Star product categories as of 09/14/2017 include:

- a. Appliances:
 - 1) Air Purifiers and Cleaners.
 - 2) Clothes Dryers (Residential).
 - 3) Clothes Washers (Commercial & Residential).
 - 4) Dehumidifiers.
 - 5) Dishwashers (Residential).
 - 6) Freezers (Residential).
 - 7) Refrigerators (Residential).
- b. Electronics and Information Technology:
 - 1) Audio/Video Equipment.
 - 2) Computers.
 - 3) Data Center Storage.

- 4) Digital Media Player.
- 5) Enterprise Servers.
- 6) Imaging Equipment.
- 7) Monitors.
- 8) Professional Displays.
- 9) Set-Top and Cable Boxes.
- 10) Telephones.
- 11) Televisions.
- 12) Uninterruptible Power Supplies.
- 13) Voice over Internet Protocol (VoIP) Phones.
- c. Food Service Equipment (Commercial):
 - 1) Dishwashers.
 - 2) Fryers.
 - 3) Griddles.
 - 4) Hot Food Holding Cabinets.
 - 5) Ice Makers.
 - 6) Ovens.
 - 7) Refrigerators and Freezers.
 - 8) Steam Cookers.
 - 9) Vending Machines.
- d. Heating and Cooling Equipment:
 - 1) Air-Source Heat Pumps (Residential).
 - 2) Boilers.
 - 3) Ceiling Fans (Residential).
 - 4) Central Air Conditioners (Residential).
 - 5) Ductless Heating and Cooling (Residential).
 - 6) Furnaces (Residential).
 - 7) Water Heaters.
 - 8) Geothermal Heat Pumps (Residential).

- 9) Light Commercial Heating and Cooling Equipment.
- 10) Room Air Conditioners (Residential).
- 11) Ventilation Fans (Residential).

e. Other:

- 1) Decorative Light Strings.
- 2) Electric Vehicle Supply Equipment.
- 3) Laboratory-Grade Refrigerators and Freezers.
- 4) Light Bulbs.
- 5) Light Fixtures.
- 6) Pool Pumps.
- 7) Roof Products.
- 8) Water Coolers.
- 9) Windows, Doors, and Skylights.

G. Materials, products, and equipment being installed which fall into any of the following categories must be FEMP-designated. FEMP-designated product categories as of 09/14/2017 include:

- 1. Boilers (Commercial).
- 2. Dishwashers (Commercial).
- 3. Electric Chillers, Air-Cooled (Commercial).
- 4. Electric Chillers, Water-Cooled (Commercial).
- 5. Exterior Lighting.
- 6. Fluorescent Ballasts.
- 7. Fluorescent Lamps, General Service.
- 8. Ice Machines, Water-Cooled.
- 9. Industrial Lighting (High/Low Bay).
- 10. Light Emitting Diode (LED) Luminaires.

H. Electronic products and equipment being installed which fall into any of the following categories shall be EPEAT registered. Electronic products and equipment covered by EPEAT program as of 09/14/2017 include:

1. Computers.
2. Displays.
3. Imaging Equipment.
4. Televisions.

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

A. Construction Indoor Air Quality Management:

1. During construction, meet or exceed recommended control measures of ANSI/SMACNA 008-2008, Chapter 3.
 2. Protect stored on-site and installed absorptive materials from moisture damage.
 3. If permanently installed air handlers are used during construction, filtration media with a minimum efficiency reporting value (MERV) of 8 must be used at each return air grille, as determined by ASHRAE Standard 52.2-1999 (with errata but without addenda). Replace all filtration media immediately prior to occupancy.
 4. Perform building flush-out as follows:
 - a. After construction ends, prior to occupancy and with interior finishes installed, perform a building flush-out by supplying a total volume of 14000 cu. ft. of outdoor air per sq. ft. of floor area while maintaining an internal temperature of at least 60 degrees Fahrenheit and a relative humidity no higher than 60 percent.
- OR

If occupancy is desired prior to flush-out completion, the space may be occupied following delivery of a minimum of 3500 cu. ft. of outdoor air per sq. ft. of floor area to the space. Once a space is occupied, it must be ventilated at a minimum rate of 0.30 cfm per sq. ft. of outside air or design minimum outside air rate determined until a total of 14000 cu. ft./sq. ft. of outside air has been delivered to the space. During each day of flush-out period, ventilation must begin a minimum of three hours prior to occupancy and continue during occupancy.

-----END-----

SECTION 01 91 00

GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 COMMISSIONING DESCRIPTION

- A. This Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS shall form the basis of the construction phase commissioning process and procedures. The Commissioning Agent shall add, modify, and refine the commissioning procedures, as approved by the Department of Veterans Affairs (VA), to suit field conditions and actual manufacturer's equipment, incorporate test data and procedure results, and provide detailed scheduling for all commissioning tasks.
- B. Various sections of the project specifications require equipment startup, testing, and adjusting services. Requirements for startup, testing, and adjusting services specified in the Division 7, Division 21, Division 22, Division 23, and Division 26 series sections of these specifications are intended to be provided in coordination with the commissioning services and are not intended to duplicate services. The Contractor shall coordinate the work required by individual specification sections with the commissioning services requirements specified herein.
- C. Where individual testing, adjusting, or related services are required in the project specifications and not specifically required by this commissioning requirements specification, the specified services shall be provided and copies of documentation, as required by those specifications shall be submitted to the VA and the Commissioning Agent to be indexed for future reference.
- D. Where training or educational services for VA are required and specified in other sections of the specifications, including but not limited to Division 7, Division 8, Division 21, Division 22, Division 23, Division 26, series sections of the specification, these services are intended to be provided in addition to the training and educational services specified herein.

- E. Commissioning is a systematic process of verifying that the building systems perform interactively according to the construction documents and the VA's operational needs. The commissioning process shall encompass and coordinate the system documentation, equipment startup, control system calibration, testing and balancing, performance testing and training. Commissioning during the construction and post-occupancy phases is intended to achieve the following specific objectives according to the contract documents:
1. Verify that the applicable equipment and systems are installed in accordance with the contract documents and according to the manufacturer's recommendations.
 2. Verify and document proper integrated performance of equipment and systems.
 3. Verify that Operations & Maintenance documentation is complete.
 4. Verify that all components requiring servicing can be accessed, serviced and removed without disturbing nearby components including ducts, piping, cabling or wiring.
 5. Verify that the VA's operating personnel are adequately trained to enable them to operate, monitor, adjust, maintain, and repair building systems in an effective and energy-efficient manner.
 6. Document the successful achievement of the commissioning objectives listed above.
- F. The commissioning process does not take away from or reduce the responsibility of the Contractor to provide a finished and fully functioning product.

1.2 CONTRACTUAL RELATIONSHIPS

- A. For this construction project, the Department of Veterans Affairs contracts with a Contractor to provide construction services. The contracts are administered by the VA Contracting Officer and the Resident Engineer as the designated representative of the Contracting Officer. On this project, the authority to modify the contract in any way is strictly limited to the authority of the Contracting Officer.
- B. In this project, only two contract parties are recognized and communications on contractual issues are strictly limited to VA Resident Engineer and the Contractor. It is the practice of the VA to require that communications between other parties to the

contracts (Subcontractors and Vendors) be conducted through the Resident Engineer and Contractor. It is also the practice of the VA that communications between other parties of the project (Commissioning Agent and Architect/Engineer) be conducted through the Resident Engineer.

- C. Whole Building Commissioning is a process that relies upon frequent and direct communications, as well as collaboration between all parties to the construction process. By its nature, a high level of communication and cooperation between the Commissioning Agent and all other parties (Architects, Engineers, Subcontractors, Vendors, third party testing agencies, etc.) is essential to the success of the Commissioning effort.
- D. With these fundamental practices in mind, the commissioning process described herein has been developed to recognize that, in the execution of the Commissioning Process, the Commissioning Agent must develop effective methods to communicate with every member of the construction team involved in delivering commissioned systems while simultaneously respecting the exclusive contract authority of the Contracting Officer and Resident Engineer. Thus, the procedures outlined in this specification must be executed within the following limitations:
 - 1. No communications (verbal or written) from the Commissioning Agent shall be deemed to constitute direction that modifies the terms of any contract between the Department of Veterans Affairs and the Contractor.
 - 2. Commissioning Issues identified by the Commissioning Agent will be delivered to the Resident Engineer and copied to the designated Commissioning Representatives for the Contractor and subcontractors on the Commissioning Team for information only in order to expedite the communication process. These issues must be understood as the professional opinion of the Commissioning Agent and as suggestions for resolution.
 - 3. In the event that any Commissioning Issues and suggested resolutions are deemed by the Resident Engineer to require either an official interpretation of the

- construction documents or require a modification of the contract documents, the Contracting Officer or Resident Engineer will issue an official directive to this effect.
4. All parties to the Commissioning Process shall be individually responsible for alerting the Resident Engineer of any issues that they deem to constitute a potential contract change prior to acting on these issues.
 5. Authority for resolution or modification of design and construction issues rests solely with the Contracting Officer or Resident Engineer, with appropriate technical guidance from the Architect/Engineer and/or Commissioning Agent.

1.3 RELATED WORK

- A. Section 01 00 00 GENERAL REQUIREMENTS.
- B. Section 01 32 16.01 ARCHITECTURAL AND ENGINEERING CPM SCHEDULES
- C. Section 01 32.16 NETWORK ANALYSIS SCHEDULES
- D. Section 01 32.16.15 PROJECT SCHEDULES (SMALL PROJECTS – DESIGN/BID/BUILD)
- E. Section 01 32.16.16 NETWORK ANALYSIS SCHEDULES (SMALL PROJECTS – DESIGN/BID/BUILD)
- F. Section 01 32.16.17 PROJECT SCHEDULES (SMALL PROJECTS- DESIGN/BUILD)
- G. Section 01 33 23 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES
- H. Section 01 81 13 SUSTAINABLE CONSTRUCTION REQUIREMENTS
- I. Section 07 08 00 FACILITY EXTERIOR CLOSURE COMMISSIONING.
- J. Section 21 08 00 COMMISSIONING OF FIRE PROTECTION SYSTEMS.
- K. Section 22 08 00 COMMISSIONING OF PLUMBING SYSTEMS.
- L. Section 23 08 00 COMMISSIONING OF HVAC SYSTEMS.
- M. Section 26 08 00 COMMISSIONING OF ELECTRICAL SYSTEMS.

1.4 SUMMARY

- A. This Section includes general requirements that apply to implementation of commissioning without regard to systems, subsystems, and equipment being commissioned.

- B. The commissioning activities have been developed to support the VA requirements to meet guidelines for Federal Leadership in Environmental, Energy, and Economic Performance.

1.5 ACRONYMS

List of Acronyms	
Acronym	Meaning
A/E	Architect / Engineer Design Team
AHJ	Authority Having Jurisdiction
ASHRAE	Association Society for Heating Air Condition and Refrigeration Engineers
BOD	Basis of Design
BSC	Building Systems Commissioning
CCTV	Closed Circuit Television
CD	Construction Documents
CMMS	Computerized Maintenance Management System
CO	Contracting Officer (VA)
COR	Contracting Officer's Representative (see also VA-RE)
COBie	Construction Operations Building Information Exchange
CPC	Construction Phase Commissioning
Cx	Commissioning
CxA	Commissioning Agent
CxM	Commissioning Manager
CxR	Commissioning Representative
DPC	Design Phase Commissioning
FPT	Functional Performance Test
GBI-GG	Green Building Initiative - Green Globes
HVAC	Heating, Ventilation, and Air Conditioning
LEED	Leadership in Energy and Environmental Design

List of Acronyms	
Acronym	Meaning
NC	Department of Veterans Affairs National Cemetery
NCA	Department of Veterans Affairs National Cemetery Administration
NEBB	National Environmental Balancing Bureau
O&M	Operations & Maintenance
OPR	Owner's Project Requirements
PFC	Pre-Functional Checklist
PFT	Pre-Functional Test
SD	Schematic Design
SO	Site Observation
TAB	Test Adjust and Balance
VA	Department of Veterans Affairs
VAMC	VA Medical Center
VA CFM	VA Office of Construction and Facilities Management
VACO	VA Central Office
VA PM	VA Project Manager
VA-RE	VA Resident Engineer
USGBC	United States Green Building Council

1.6 DEFINITIONS

Acceptance Phase Commissioning: Commissioning tasks executed after most construction has been completed, most Site Observations and Static Tests have been completed and Pre-Functional Testing has been completed and accepted. The main commissioning activities performed during this phase are verification that the installed systems are functional by conducting Systems Functional Performance tests and Owner Training.

Accuracy: The capability of an instrument to indicate the true value of a measured quantity.

Back Check: A back check is a verification that an agreed upon solution to a design comment has been adequately addressed in a subsequent design review

Basis of Design (BOD): The Engineer's Basis of Design is comprised of two components: the Design Criteria and the Design Narrative, these documents record the concepts, calculations, decisions, and product selections used to meet the Owner's Project Requirements (OPR) and to satisfy applicable regulatory requirements, standards, and guidelines.

Benchmarks: Benchmarks are the comparison of a building's energy usage to other similar buildings and to the building itself.. For example, ENERGY STAR Portfolio Manager is a frequently used and nationally recognized building energy benchmarking tool.

Building Information Modeling (BIM): Building Information Modeling is a parametric database which allows a building to be designed and constructed virtually in 3D, and provides reports both in 2D views and as schedules. This electronic information can be extracted and reused for pre-populating facility management CMMS systems. Building Systems Commissioning (BSC): NEBB acronym used to designate its commissioning program.

Calibrate: The act of comparing an instrument of unknown accuracy with a standard of known accuracy to detect, correlate, report, or eliminate by adjustment any variation in the accuracy of the tested instrument.

CCTV: Closed circuit Television. Normally used for security surveillance and alarm detections as part of a special electrical security system.

COBie: Construction Operations Building Information Exchange (COBie) is an electronic industry data format used to transfer information developed during design, construction, and commissioning into the Computer Maintenance Management Systems (CMMS) used to operate facilities. See the Whole Building Design Guide website for further information (<http://www.wbdg.org/resources/cobie.php>)

Commissionability: Defines a design component or construction process that has the necessary elements that will allow a system or component to be effectively measured, tested, operated and commissioned

Commissioning Agent (CxA): The qualified Commissioning Professional who administers the Cx process by managing the Cx team and overseeing the Commissioning Process. Where CxA is used in this specification it means the Commissioning Agent, members of his staff or appointed members of the commissioning team. Note that LEED uses the term Commissioning Authority in lieu of Commissioning Agent.

Commissioning Checklists: Lists of data or inspections to be verified to ensure proper system or component installation, operation, and function. Verification checklists are developed and used during all phases of the commissioning process to verify that the Owner's Project Requirements (OPR) is being achieved.

Commissioning Design Review: The commissioning design review is a collaborative review of the design professionals design documents for items pertaining to the following: owner's project requirements; basis of design; operability and maintainability (O&M) including documentation; functionality; training; energy efficiency, control systems' sequence of operations including building automation system features; commissioning specifications and the ability to functionally test the systems.

Commissioning Issue: A condition identified by the Commissioning Agent or other member of the Commissioning Team that adversely affects the commissionability, operability, maintainability, or functionality of a system, equipment, or component. A condition that is in conflict with the Contract Documents and/or performance requirements of the installed systems and components. (See also – Commissioning Observation).

Commissioning Manager (CxM): A qualified individual appointed by the Contractor to manage the commissioning process on behalf of the Contractor.

Commissioning Observation: An issue identified by the Commissioning Agent or other member of the Commissioning Team that does not conform to the project OPR, contract documents or standard industry best practices. (See also Commissioning Issue)

Commissioning Plan: A document that outlines the commissioning process, commissioning scope and defines responsibilities, processes, schedules, and the documentation requirements of the Commissioning Process.

Commissioning Process: A quality focused process for enhancing the delivery of a project. The process focuses upon verifying and documenting that the facility and all of its systems, components, and assemblies are planned, designed, installed, tested, can be operated, and maintained to meet the Owner's Project Requirements.

Commissioning Report: The final commissioning document which presents the commissioning process results for the project. Cx reports include an executive summary, the commissioning plan, issue log, correspondence, and all appropriate check sheets and test forms.

Commissioning Representative (CxR): An individual appointed by a sub-contractor to manage the commissioning process on behalf of the sub-contractor.

Commissioning Specifications: The contract documents that detail the objective, scope and implementation of the commissioning process as developed in the Commissioning Plan.

Commissioning Team: Individual team members whose coordinated actions are responsible for implementing the Commissioning Process.

Construction Phase Commissioning: All commissioning efforts executed during the construction process after the design phase and prior to the Acceptance Phase Commissioning.

Contract Documents (CD): Contract documents include design and construction contracts, price agreements and procedure agreements. Contract Documents also include all final and complete drawings, specifications and all applicable contract modifications or supplements.

Construction Phase Commissioning (CPC): All commissioning efforts executed during the construction process after the design phase and prior to the Acceptance Phase Commissioning.

Coordination Drawings: Drawings showing the work of all trades that are used to illustrate that equipment can be installed in the space allocated without compromising equipment function or access for maintenance and replacement. These drawings graphically illustrate and dimension manufacturers' recommended maintenance clearances. On mechanical projects, coordination drawings include structural steel, ductwork, major piping and electrical conduit and show the elevations and locations of the above components.

Data Logging: The monitoring and recording of temperature, flow, current, status, pressure, etc. of equipment using stand-alone data recorders.

Deferred System Test: Tests that cannot be completed at the end of the acceptance phase due to ambient conditions, schedule issues or other conditions preventing testing during the normal acceptance testing period.

Deficiency: See "Commissioning Issue".

Design Criteria: A listing of the VA Design Criteria outlining the project design requirements, including its source. These are used during the design process to show the design elements meet the OPR.

Design Intent: The overall term that includes the OPR and the BOD. It is a detailed explanation of the ideas, concepts, and criteria that are defined by the owner to be important. The design intent documents are utilized to provide a written record of these ideas, concepts and criteria.

Design Narrative: A written description of the proposed design solutions that satisfy the requirements of the OPR.

Design Phase Commissioning (DPC): All commissioning tasks executed during the design phase of the project.

Environmental Systems: Systems that use a combination of mechanical equipment, airflow, water flow and electrical energy to provide heating, ventilating, air conditioning, humidification, and dehumidification for the purpose of human comfort or process control of temperature and humidity.

Executive Summary: A section of the Commissioning report that reviews the general outcome of the project. It also includes any unresolved issues, recommendations for the resolution of unresolved issues and all deferred testing requirements.

Functionality: This defines a design component or construction process which will allow a system or component to operate or be constructed in a manner that will produce the required outcome of the OPR.

Functional Test Procedure (FTP): A written protocol that defines methods, steps, personnel, and acceptance criteria for tests conducted on components, equipment, assemblies, systems, and interfaces among systems.

Industry Accepted Best Practice: A design component or construction process that has achieved industry consensus for quality performance and functionality. Refer to the current edition of the NEBB Design Phase Commissioning Handbook for examples.

Installation Verification: Observations or inspections that confirm the system or component has been installed in accordance with the contract documents and to industry accepted best practices.

Integrated System Testing: Integrated Systems Testing procedures entail testing of multiple integrated systems performance to verify proper functional interface between systems. Typical Integrated Systems Testing includes verifying that building systems respond properly to loss of utility, transfer to emergency power sources, re-transfer from emergency power source to normal utility source; interface between HVAC controls and Fire Alarm systems for equipment shutdown, interface between Fire Alarm system and elevator control systems for elevator recall and shutdown; interface between Fire Alarm System and Security Access Control Systems to control access to spaces during fire alarm conditions; and other similar tests as determined for each specific project.

Issues Log: A formal and ongoing record of problems or concerns – and their resolution – that have been raised by members of the Commissioning Team during the course of the Commissioning Process.

Lessons Learned Workshop: A workshop conducted to discuss and document project successes and identify opportunities for improvements for future projects.

Maintainability: A design component or construction process that will allow a system or component to be effectively maintained. This includes adequate room for access to adjust and repair the equipment. Maintainability also includes components that have readily obtainable repair parts or service.

Manual Test: Testing using 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').

Owner's Project Requirements (OPR): A written document that details the project requirements and the expectations of how the building and its systems will be used and operated. These include project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information.

Peer Review: A formal in-depth review separate from the commissioning review processes. The level of effort and intensity is much greater than a typical commissioning facilitation or extended commissioning review. The VA usually hires an independent third-party (called the IDIQ A/E) to conduct peer reviews.

Precision: The ability of an instrument to produce repeatable readings of the same quantity under the same conditions. The precision of an instrument refers to its ability to produce a tightly grouped set of values around the mean value of the measured quantity.

Pre-Design Phase Commissioning: Commissioning tasks performed prior to the commencement of design activities that includes project programming and the development of the commissioning process for the project

Pre-Functional Checklist (PFC): A form used by the contractor to verify that appropriate components are onsite, correctly installed, set up, calibrated, functional and ready for functional testing.

Pre-Functional Test (PFT): An inspection or test that is done before functional testing. PFT's include installation verification and system and component start up tests.

Procedure or Protocol: A defined approach that outlines the execution of a sequence of work or operations. Procedures are used to produce repeatable and defined results.

Range: The upper and lower limits of an instrument's ability to measure the value of a quantity for which the instrument is calibrated.

Resolution: This word has two meanings in the Cx Process. The first refers to the smallest change in a measured variable that an instrument can detect. The second refers to the implementation of actions that correct a tested or observed deficiency.

Site Observation Visit: On-site inspections and observations made by the Commissioning Agent for the purpose of verifying component, equipment, and system installation, to observe contractor testing, equipment start-up procedures, or other purposes.

Site Observation Reports (SO): Reports of site inspections and observations made by the Commissioning Agent. Observation reports are intended to provide early indication of an installation issue which will need correction or analysis.

Special System Inspections: Inspections required by a local code authority prior to occupancy and are not normally a part of the commissioning process.

Static Tests: Tests or inspections that validate a specified static condition such as pressure testing. Static tests may be specification or code initiated.

Start Up Tests: Tests that validate the component or system is ready for automatic operation in accordance with the manufactures requirements.

Systems Manual: A system-focused composite document that includes all information required for the owners operators to operate the systems.

Test Procedure: A written protocol that defines methods, personnel, and expectations for tests conducted on components, equipment, assemblies, systems, and interfaces among systems.

Testing: The use of specialized and calibrated instruments to measure parameters such as: temperature, pressure, vapor flow, air flow, fluid flow, rotational speed, electrical characteristics, velocity, and other data in order to determine performance, operation, or function.

Testing, Adjusting, and Balancing (TAB): A systematic process or service applied to heating, ventilating and air-conditioning (HVAC) systems and other environmental systems to achieve and document air and hydronic flow rates. The standards and procedures for providing these services are referred to as “Testing, Adjusting, and Balancing” and are described in the Procedural Standards for the Testing, Adjusting and Balancing of Environmental Systems, published by NEBB or AABC.

Thermal Scans: Thermographic pictures taken with an Infrared Thermographic Camera. Thermographic pictures show the relative temperatures of objects and surfaces and are used to identify leaks, thermal bridging, thermal intrusion, electrical overload conditions, moisture containment, and insulation failure.

Training Plan: A written document that details, in outline form the expectations of the operator training. Training agendas should include instruction on how to obtain service, operate, startup, shutdown and maintain all systems and components of the project.

Trending: Monitoring over a period of time with the building automation system.

Unresolved Commissioning Issue: Any Commissioning Issue that, at the time that the Final Report or the Amended Final Report is issued that has not been either resolved by the construction team or accepted by the VA. **Validation:** The process by which work is verified as complete and operating correctly:

1. First party validation occurs when a firm or individual verifying the task is the same firm or individual performing the task.
2. Second party validation occurs when the firm or individual verifying the task is under the control of the firm performing the task or has other possibilities of financial conflicts of interest in the resolution (Architects, Designers, General Contractors and Third Tier Subcontractors or Vendors).
3. Third party validation occurs when the firm verifying the task is not associated with or under control of the firm performing or designing the task.

Verification: The process by which specific documents, components, equipment, assemblies, systems, and interfaces among systems are confirmed to comply with the criteria described in the Owner’s Project Requirements.

Warranty Phase Commissioning: Commissioning efforts executed after a project has been completed and accepted by the Owner. Warranty Phase Commissioning includes follow-up on verification of system performance, measurement and verification tasks and assistance in identifying warranty issues and enforcing warranty provisions of the construction contract.

Warranty Visit: A commissioning meeting and site review where all outstanding warranty issues and deferred testing is reviewed and discussed.

Whole Building Commissioning: Commissioning of building systems such as Building Envelope, HVAC, Electrical, Special Electrical (Fire Alarm, Security & Communications), Plumbing and Fire Protection as described in this specification.

1.7 SYSTEMS TO BE COMMISSIONED

- A. Commissioning of a system or systems specified for this project is part of the construction process. Documentation and testing of these systems, as well as training of the VA's Operation and Maintenance personnel, is required in cooperation with the VA and the Commissioning Agent.
- B. The following systems will be commissioned as part of this project:

Systems To Be Commissioned	
System	Description
Building Exterior Closure	
Foundations (excluding structural)	Standard, special, slab-on-grade, vapor barriers, air barriers
Basements	Basement walls, crawl spaces, waterproofing, drainage
Superstructure	Floor construction, roof construction, sunshades, connections to adjacent structures
Exterior Closure	Exterior walls, exterior windows, exterior doors, louvers, grilles and sunscreens,

Systems To Be Commissioned	
System	Description
Roofing	Roof system (including parapet), roof openings (skylights, pipe chases, ducts, equipment curbs, etc.)
Note:	The emphasis on commissioning the above building envelope systems is on control of air flow, heat flow, noise, infrared, ultraviolet, rain penetration, moisture, durability, security, reliability, constructability, maintainability, and sustainability.
Fire Suppression	
Fire Pump	Fire Pump, jockey pump, fire pump controller/ATS
Fire Sprinkler Systems	Wet pipe system, dry pipe system, pre-action system, special agent systems
Plumbing	
Domestic Water Distribution	Booster pumps, backflow preventers, water softeners, potable water storage tanks
Domestic Hot Water Systems	Water heaters**, heat exchangers, circulation pumps, point-of-use water heaters*
Sewerage Pump Systems	Sewage ejectors
Wastewater Pump Systems	Sump pumps
Sanitary Waste Interceptors	Grease interceptors, acid neutralizers
General Service Air Systems	Packaged compressor systems, air dryers, filtration
HVAC	

Systems To Be Commissioned	
System	Description
Noise and Vibration Control	Noise and vibration levels for critical equipment such as Air Handlers, Chillers, Cooling Towers, Boilers, Generators, etc. will be commissioned as part of the system commissioning
Direct Digital Control System**	Operator Interface Computer, Operator Work Station (including graphics, point mapping, trends, alarms), Network Communications Modules and Wiring, Integration Panels. [DDC Control panels will be commissioned with the systems controlled by the panel]
Chilled Water System**	Chillers (centrifugal, rotary screw, air-cooled), pumps (primary, secondary, variable primary), VFDs associated with chilled water system components, DDC Control Panels (including integration with Building Control System)
Condenser Water System**	Cooling Towers, Fluid Coolers, heat exchangers/economizers, pumps, VFDs associated with condenser water system components, DDC control panels.
Steam/Heating Hot Water System**	Boilers, boiler feed water system, economizers/heat recovery equipment, condensate recovery, water treatment, boiler fuel system, controls, interface with facility DDC system.
HVAC Air Handling Systems**	Air handling Units, packaged rooftop AHU, Outdoor Air conditioning units, humidifiers, DDC control panels
HVAC Ventilation/Exhaust Systems	General exhaust, toilet exhaust, laboratory exhaust, isolation exhaust, room pressurization control systems

Systems To Be Commissioned	
System	Description
HVAC Energy Recovery Systems**	Heat Wheels, Heat Recovery Loops, AHU Integrated Heat Recovery
HVAC Terminal Unit Systems**	VAV Terminal Units, CAV terminal units, fan coil units, fin-tube radiation, unit heaters
Decentralized Unitary HVAC Systems*	Split-system HVAC systems, controls, interface with facility DDC
Unitary Heat Pump Systems**	Water-source heat pumps, controls, interface with facility DDC
Humidity Control Systems	Humidifiers, de-humidifiers, controls, interface with facility DDC
Hydronic Distribution Systems	Pumps, DDC control panels, heat exchangers,
Facility Fuel Systems	Boiler fuel system, generator fuel system
Geothermal Energy Direct Use Heating **	Geothermal well, ground heat exchanger, geothermal pumps, heat exchanger, valves, instrumentation
Solar Energy Heating Systems **	Solar collectors, heat exchangers, storage tanks, solar-boosted domestic hot water heater, pumps, valves, instrumentation
Facility Fuel Gas Systems	Witness Natural gas piping pressure testing, natural gas compressors and storage, propane storage
Smoke Evacuation System	Atrium smoke evacuation, other smoke evacuation and smoke management systems, controls, interface with other systems (fire alarm), emergency operation.
Electrical	

Systems To Be Commissioned	
System	Description
Lighting & Lighting Control** Systems	Emergency lighting, occupancy sensors, lighting control systems, architectural dimming systems, theatrical dimming systems, exterior lighting and controls
Renewable Energy Sources	
Geothermal Energy Electrical Generation Systems **	Geothermal well, DC-AC Inverters, storage batteries, turbine generator modules, switchgear, combiner boxes, instrumentation, monitoring and control systems
Solar Energy Electrical Power Generation Systems **	Solar collector modules, DC-AC inverter, storage batteries, combiners, Switchgear, instrumentation, monitoring and control systems
Wind Energy Electrical Power Generation Systems **	Wind Turbines, DC-AC inverter, storage batteries, combiners, switchgear, instrumentation, monitoring and control systems
Integrated Systems Tests	
Loss of Power Response	Loss of power to building, loss of power to campus, restoration of power to building, restoration of power to campus.
Fire Alarm Response	Integrated System Response to Fire Alarm Condition and Return to Normal
Table Notes	
** Denotes systems that LEED requires to be commissioned to comply with the LEED Fundamental Commissioning pre-requisite.	

1.8 COMMISSIONING TEAM

- A. The commissioning team shall consist of, but not be limited to, representatives of Contractor, including Project Superintendent and subcontractors, installers, schedulers,

suppliers, and specialists deemed appropriate by the Department of Veterans Affairs (VA) and Commissioning Agent.

B. Members Appointed by Contractor:

1. Commissioning Agent: The designated person, company, or entity that plans, schedules, and coordinates the commissioning team to implement the commissioning process.
2. Contractor' Commissioning Manager: The designated person, company, or entity that plans, schedules and coordinates the commissioning activities for the construction team.
3. Contractor's Commissioning Representative(s): Individual(s), each having authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated actions.

C. Members Appointed by VA:

1.
 1. User: Representatives of the facility user and operation and maintenance personnel.
 2. A/E: Representative of the Architect and engineering design professionals.

1.9 VA'S COMMISSIONING RESPONSIBILITIES

B. Assign operation and maintenance personnel and schedule them to participate in commissioning team activities including, but not limited to, the following:

1. Coordination meetings.
2. Training in operation and maintenance of systems, subsystems, and equipment.
3. Testing meetings.
4. Witness and assist in Systems Functional Performance Testing.
5. Demonstration of operation of systems, subsystems, and equipment.

C. Provide the Construction Documents, prepared by Architect and approved by VA, to the Commissioning Agent and for use in managing the commissioning process, developing the commissioning plan, systems manuals, and reviewing the operation and maintenance training plan.

1.10 CONTRACTOR'S COMMISSIONING RESPONSIBILITIES

- A. Appoint an individual, company or firm to act as the Commissioning Agent.
- B. The Contractor shall assign a Commissioning Manager to manage commissioning activities of the Contractor, and subcontractors.
- C. The Contractor shall ensure that the commissioning responsibilities outlined in these specifications are included in all subcontracts and that subcontractors comply with the requirements of these specifications.
- D. The Contractor shall ensure that each installing subcontractor shall assign representatives with expertise and authority to act on behalf of the subcontractor and schedule them to participate in and perform commissioning team activities including, but not limited to, the following:
 - 1. Participate in commissioning coordination meetings.
 - 2. Conduct operation and maintenance training sessions in accordance with approved training plans.
 - 3. Verify that Work is complete and systems are operational according to the Contract Documents, including calibration of instrumentation and controls.
 - 4. Evaluate commissioning issues and commissioning observations identified in the Commissioning Issues Log, field reports, test reports or other commissioning documents. In collaboration with entity responsible for system and equipment installation, recommend corrective action.
 - 5. Review and comment on commissioning documentation.
 - 6. Participate in meetings to coordinate Systems Functional Performance Testing.
 - 7. Provide schedule for operation and maintenance data submittals, equipment startup, and testing to Commissioning Agent for incorporation into the commissioning plan.
 - 8. Provide information to the Commissioning Agent for developing commissioning plan.
 - 9. Participate in training sessions for VA's operation and maintenance personnel.

10. Provide technicians who are familiar with the construction and operation of installed systems and who shall develop specific test procedures to conduct Systems Functional Performance Testing of installed systems.

1.11 COMMISSIONING AGENT'S RESPONSIBILITIES

- A. Organize and lead the commissioning team.
- B. Prepare the commissioning plan. See Paragraph 1.11-A of this specification Section for further information.
- C. Review and comment on selected submittals from the Contractor for general conformance with the Construction Documents. Review and comment on the ability to test and operate the system and/or equipment, including providing gages, controls and other components required to operate, maintain, and test the system. Review and comment on performance expectations of systems and equipment and interfaces between systems relating to the Construction Documents.
- D. At the beginning of the construction phase, conduct an initial construction phase coordination meeting for the purpose of reviewing the commissioning activities and establishing tentative schedules for operation and maintenance submittals; operation and maintenance training sessions; TAB Work; Pre-Functional Checklists, Systems Functional Performance Testing; and project completion.
- E. Convene commissioning team meetings for the purpose of coordination, communication, and conflict resolution; discuss status of the commissioning processes. Responsibilities include arranging for facilities, preparing agenda and attendance lists, and notifying participants. The Commissioning Agent shall prepare and distribute minutes to commissioning team members and attendees within five workdays of the commissioning meeting.
- F. Observe construction and report progress, observations and issues. Observe systems and equipment installation for adequate accessibility for maintenance and component replacement or repair, and for general conformance with the Construction Documents.
- G. Prepare Project specific Pre-Functional Checklists and Systems Functional Performance Test procedures.

- H. Coordinate Systems Functional Performance Testing schedule with the Contractor.
- I. Witness selected systems startups.
- J. Verify selected Pre-Functional Checklists completed and submitted by the Contractor.
- K. Witness and document Systems Functional Performance Testing.
- L. Compile test data, inspection reports, and certificates and include them in the systems manual and commissioning report.

- M. Review and comment on operation and maintenance (O&M) documentation and systems manual outline for compliance with the Contract Documents. Operation and maintenance documentation requirements are specified in Paragraph 1.25, Section 01 00 00 GENERAL REQUIREMENTS.

- N. Review operation and maintenance training program developed by the Contractor. Verify training plans provide qualified instructors to conduct operation and maintenance training.
- O. Prepare commissioning Field Observation Reports.
- P. Prepare the Final Commissioning Report.
- Q. Return to the site at 10 months into the 12 month warranty period and review with facility staff the current building operation and the condition of outstanding issues related to the original and seasonal Systems Functional Performance Testing. Also interview facility staff and identify problems or concerns they have operating the building as originally intended. Make suggestions for improvements and for recording these changes in the O&M manuals. Identify areas that may come under warranty or under the original construction contract. Assist facility staff in developing reports, documents and requests for services to remedy outstanding problems.
- R. Assemble the final commissioning documentation, including the Final Commissioning Report and Addendum to the Final Commissioning Report.

1.12 COMMISSIONING DOCUMENTATION

- A. Commissioning Plan: A document, prepared by Commissioning Agent, that outlines the schedule, allocation of resources, and documentation requirements of the commissioning process, and shall include, but is not limited, to the following:
1. Plan for delivery and review of submittals, systems manuals, and other documents and reports. Identification of the relationship of these documents to other functions and a detailed description of submittals that are required to support the commissioning processes. Submittal dates shall include the latest date approved submittals must be received without adversely affecting commissioning plan.
 2. Description of the organization, layout, and content of commissioning documentation (including systems manual) and a detailed description of documents to be provided along with identification of responsible parties.
 3. Identification of systems and equipment to be commissioned.
 4. Schedule of Commissioning Coordination meetings.
 5. Identification of items that must be completed before the next operation can proceed.
 6. Description of responsibilities of commissioning team members.
 7. Description of observations to be made.
 8. Description of requirements for operation and maintenance training.
 9. Schedule for commissioning activities with dates coordinated with overall construction schedule.
 10. Process and schedule for documenting changes on a continuous basis to appear in Project Record Documents.
 11. Process and schedule for completing prestart and startup checklists for systems, subsystems, and equipment to be verified and tested.
 12. Preliminary Systems Functional Performance Test procedures.
- B. Systems Functional Performance Test Procedures: The Commissioning Agent will develop Systems Functional Performance Test Procedures for each system to be commissioned, including subsystems, or equipment and interfaces or interlocks with

other systems. Systems Functional Performance Test Procedures will include a separate entry, with space for comments, for each item to be tested. Preliminary Systems Functional Performance Test Procedures will be provided to the VA, Architect/Engineer, and Contractor for review and comment. The Systems Performance Test Procedure will include test procedures for each mode of operation and provide space to indicate whether the mode under test responded as required. Each System Functional Performance Test procedure, regardless of system, subsystem, or equipment being tested, shall include, but not be limited to, the following:

1. Name and identification code of tested system.
 2. Test number.
 3. Time and date of test.
 4. Indication of whether the record is for a first test or retest following correction of a problem or issue.
 5. Dated signatures of the person performing test and of the witness, if applicable.
 6. Individuals present for test.
 7. Observations and Issues.
 8. Issue number, if any, generated as the result of test.
- C. Pre-Functional Checklists: The Commissioning Agent will prepare Pre-Functional Checklists. Pre-Functional Checklists shall be completed and signed by the Contractor, verifying that systems, subsystems, equipment, and associated controls are ready for testing. The Commissioning Agent will spot check Pre-Functional Checklists to verify accuracy and readiness for testing. Inaccurate or incomplete Pre-Functional Checklists shall be returned to the Contractor for correction and resubmission.
- D. Test and Inspection Reports: The Commissioning Agent will record test data, observations, and measurements on Systems Functional Performance Test Procedure. The report will also include recommendation for system acceptance or non-acceptance. Photographs, forms, and other means appropriate for the application shall be included with data. Commissioning Agent Will compile test and inspection reports and test and inspection certificates and include them in systems manual and commissioning report.

- E. Corrective Action Documents: The Commissioning Agent will document corrective action taken for systems and equipment that fail tests. The documentation will include any required modifications to systems and equipment and/or revisions to test procedures, if any. The Commissioning Agent will witness and document any retesting of systems and/or equipment requiring corrective action and document retest results.
- F. Commissioning Issues Log: The Commissioning Agent will prepare and maintain Commissioning Issues Log that describes Commissioning Issues and Commissioning Observations that are identified during the Commissioning process. These observations and issues include, but are not limited to, those that are at variance with the Contract Documents. The Commissioning Issues Log will identify and track issues as they are encountered, the party responsible for resolution, progress toward resolution, and document how the issue was resolved. The Master Commissioning Issues Log will also track the status of unresolved issues.
 - 1. Creating an Commissioning Issues Log Entry:
 - a. Identify the issue with unique numeric or alphanumeric identifier by which the issue may be tracked.
 - b. Assign a descriptive title for the issue.
 - c. Identify date and time of the issue.
 - d. Identify test number of test being performed at the time of the observation, if applicable, for cross reference.
 - e. Identify system, subsystem, and equipment to which the issue applies.
 - f. Identify location of system, subsystem, and equipment.
 - g. Include information that may be helpful in diagnosing or evaluating the issue.
 - h. Note recommended corrective action.
 - i. Identify commissioning team member responsible for corrective action.
 - j. Identify expected date of correction.
 - k. Identify person that identified the issue.
 - 2. Documenting Issue Resolution:
 - a. Log date correction is completed or the issue is resolved.

- b. Describe corrective action or resolution taken. Include description of diagnostic steps taken to determine root cause of the issue, if any.
 - c. Identify changes to the Contract Documents that may require action.
 - d. State that correction was completed and system, subsystem, and equipment are ready for retest, if applicable.
 - e. Identify person(s) who corrected or resolved the issue.
 - f. Identify person(s) verifying the issue resolution.
- G. Final Commissioning Report: The Commissioning Agent will document results of the commissioning process, including unresolved issues, and performance of systems, subsystems, and equipment. The Commissioning Report will indicate whether systems, subsystems, and equipment have been properly installed and are performing according to the Contract Documents. This report will be used by the Department of Veterans Affairs when determining that systems will be accepted. This report will be used to evaluate systems, subsystems, and equipment and will serve as a future reference document during VA occupancy and operation. It shall describe components and performance that exceed requirements of the Contract Documents and those that do not meet requirements of the Contract Documents. The commissioning report will include, but is not limited to, the following:
- 1. Lists and explanations of substitutions; compromises; variances with the Contract Documents; record of conditions; and, if appropriate, recommendations for resolution. Design Narrative documentation maintained by the Commissioning Agent.
 - 2. Commissioning plan.
 - 3. Pre-Functional Checklists completed by the Contractor, with annotation of the Commissioning Agent review and spot check.
 - 4. Systems Functional Performance Test Procedures, with annotation of test results and test completion.
 - 5. Commissioning Issues Log.

6. Listing of deferred and off season test(s) not performed, including the schedule for their completion.
- H. Addendum to Final Commissioning Report: The Commissioning Agent will prepare an Addendum to the Final Commissioning Report near the end of the Warranty Period. The Addendum will indicate whether systems, subsystems, and equipment are complete and continue to perform according to the Contract Documents. The Addendum to the Final Commissioning Report shall include, but is not limited to, the following:
1. Documentation of deferred and off season test(s) results.
 2. Completed Systems Functional Performance Test Procedures for off season test(s).
 3. Documentation that unresolved system performance issues have been resolved.
 4. Updated Commissioning Issues Log, including status of unresolved issues.
 5. Identification of potential Warranty Claims to be corrected by the Contractor.
- I. Systems Manual: The Commissioning Agent will gather required information and compile the Systems Manual. The Systems Manual will include, but is not limited to, the following:
1. Design Narrative, including system narratives, schematics, single-line diagrams, flow diagrams, equipment schedules, and changes made throughout the Project.
 2. Reference to Final Commissioning Plan.
 3. Reference to Final Commissioning Report.
 4. Approved Operation and Maintenance Data as submitted by the Contractor.

1.13 SUBMITTALS

- A. Preliminary Commissioning Plan Submittal: The Commissioning Agent has prepared a Preliminary Commissioning Plan based on the final Construction Documents. The Preliminary Commissioning Plan is included as an Appendix to this specification section. The Preliminary Commissioning Plan is provided for information only. It contains preliminary information about the following commissioning activities:
1. The Commissioning Team: A list of commissioning team members by organization.
 2. Systems to be commissioned. A detailed list of systems to be commissioned for the project. This list also provides preliminary information on systems/equipment

- submittals to be reviewed by the Commissioning Agent; preliminary information on Pre-Functional Checklists that are to be completed; preliminary information on Systems Performance Testing, including information on testing sample size (where authorized by the VA).
3. Commissioning Team Roles and Responsibilities: Preliminary roles and responsibilities for each Commissioning Team member.
 4. Commissioning Documents: A preliminary list of commissioning-related documents, include identification of the parties responsible for preparation, review, approval, and action on each document.
 5. Commissioning Activities Schedule: Identification of Commissioning Activities, including Systems Functional Testing, the expected duration and predecessors for the activity.
 6. Pre-Functional Checklists: Preliminary Pre-Functional Checklists for equipment, components, subsystems, and systems to be commissioned. These Preliminary Pre-Functional Checklists provide guidance on the level of detailed information the Contractor shall include on the final submission.
 7. Systems Functional Performance Test Procedures: Preliminary step-by-step System Functional Performance Test Procedures to be used during Systems Functional Performance Testing. These Preliminary Systems Functional Performance procedures provide information on the level of testing rigor, and the level of Contractor support required during performance of system's testing.
- B. Final Commissioning Plan Submittal: Based on the Final Construction Documents and the Contractor's project team, the Commissioning Agent will prepare the Final Commissioning Plan as described in this section. The Commissioning Agent will submit three hard copies and three sets of electronic files of Final Commissioning Plan. The Contractor shall review the Commissioning Plan and provide any comments to the VA. The Commissioning Agent will incorporate review comments into the Final Commissioning Plan as directed by the VA.

- C. Systems Functional Performance Test Procedure: The Commissioning Agent will submit preliminary Systems Functional Performance Test Procedures to the Contractor, and the VA for review and comment. The Contractor shall return review comments to the VA and the Commissioning Agent. The VA will also return review comments to the Commissioning Agent. The Commissioning Agent will incorporate review comments into the Final Systems Functional Test Procedures to be used in Systems Functional Performance Testing.
- D. Pre-Functional Checklists: The Commissioning Agent will submit Pre-Functional Checklists to be completed by the Contractor.
- E. Test and Inspection Reports: The Commissioning Agent will submit test and inspection reports to the VA with copies to the Contractor and the Architect/Engineer.
- F. Corrective Action Documents: The Commissioning Agent will submit corrective action documents to the VA Resident Engineer with copies to the Contractor and Architect.
- G. Preliminary Commissioning Report Submittal: The Commissioning Agent will submit three electronic copies of the preliminary commissioning report. One electronic copy, with review comments, will be returned to the Commissioning Agent for preparation of the final submittal.
- H. Final Commissioning Report Submittal: The Commissioning Agent will submit four sets of electronically formatted information of the final commissioning report to the VA. The final submittal will incorporate comments as directed by the VA.
- I. Data for Commissioning:
 - 1. The Commissioning Agent will request in writing from the Contractor specific information needed about each piece of commissioned equipment or system to fulfill requirements of the Commissioning Plan.
 - 2. The Commissioning Agent may request further documentation as is necessary for the commissioning process or to support other VA data collection requirements, including Construction Operations Building Information Exchange (COBIE), Building Information Modeling (BIM), etc.

1.14 COMMISSIONING PROCESS

- A. The Commissioning Agent will be responsible for the overall management of the commissioning process as well as coordinating scheduling of commissioning tasks with the VA and the Contractor. As directed by the VA, the Contractor shall incorporate Commissioning tasks, including, but not limited to, Systems Functional Performance Testing (including predecessors) with the Master Construction Schedule.
- B. Within 60 days of contract award, the Contractor shall designate a specific individual as the Commissioning Manager (CxM) to manage and lead the commissioning effort on behalf of the Contractor. The Commissioning Manager shall be the single point of contact and communications for all commissioning related services by the Contractor.
- C. Within 60 days of contract award, the Contractor shall ensure that each subcontractor designates specific individuals as Commissioning Representatives (CXR) to be responsible for commissioning related tasks. The Contractor shall ensure the designated Commissioning Representatives participate in the commissioning process as team members providing commissioning testing services, equipment operation, adjustments, and corrections if necessary. The Contractor shall ensure that all Commissioning Representatives shall have sufficient authority to direct their respective staff to provide the services required, and to speak on behalf of their organizations in all commissioning related contractual matters.

1.15 QUALITY ASSURANCE

- A. Instructor Qualifications: Factory authorized service representatives shall be experienced in training, operation, and maintenance procedures for installed systems, subsystems, and equipment.
- B. Test Equipment Calibration: The Contractor shall comply with test equipment manufacturer's calibration procedures and intervals. Recalibrate test instruments immediately whenever instruments have been repaired following damage or dropping. Affix calibration tags to test instruments. Instruments shall have been calibrated within six months prior to use.

1.16 COORDINATION

- A. Management: The Commissioning Agent will coordinate the commissioning activities with the VA and Contractor. The Commissioning Agent will submit commissioning documents and information to the VA. All commissioning team members shall work together to fulfill their contracted responsibilities and meet the objectives of the contract documents.
- B. Scheduling: The Contractor shall work with the Commissioning Agent and the VA to incorporate the commissioning activities into the construction schedule. The Commissioning Agent will provide sufficient information (including, but not limited to, tasks, durations and predecessors) on commissioning activities to allow the Contractor and the VA to schedule commissioning activities. All parties shall address scheduling issues and make necessary notifications in a timely manner in order to expedite the project and the commissioning process. The Contractor shall update the Master Construction as directed by the VA.
- C. Initial Schedule of Commissioning Events: The Commissioning Agent will provide the initial schedule of primary commissioning events in the Commissioning Plan and at the commissioning coordination meetings. The Commissioning Plan will provide a format for this schedule. As construction progresses, more detailed schedules will be developed by the Contractor with information from the Commissioning Agent.
- D. Commissioning Coordinating Meetings: The Commissioning Agent will conduct periodic Commissioning Coordination Meetings of the commissioning team to review status of commissioning activities, to discuss scheduling conflicts, and to discuss upcoming commissioning process activities.
- E. Pretesting Meetings: The Commissioning Agent will conduct pretest meetings of the commissioning team to review startup reports, Pre-Functional Checklist results, Systems Functional Performance Testing procedures, testing personnel and instrumentation requirements.
- F. Systems Functional Performance Testing Coordination: The Contractor shall coordinate testing activities to accommodate required quality assurance and control services with a

minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting. The Contractor shall coordinate the schedule times for tests, inspections, obtaining samples, and similar activities.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

- A. The Contractor shall provide all standard and specialized testing equipment required to perform Systems Functional Performance Testing. Test equipment required for Systems Functional Performance Testing will be identified in the detailed System Functional Performance Test Procedure prepared by the Commissioning Agent.
- B. Data logging equipment and software required to test equipment shall be provided by the Contractor.
- C. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the Specifications. If not otherwise noted, the following minimum requirements apply: Temperature sensors and digital thermometers shall have a certified calibration within the past year to an accuracy of 0.5 °C (1.0 °F) and a resolution of + or - 0.1 °C (0.2 °F). Pressure sensors shall have an accuracy of + or - 2.0% of the value range being measured (not full range of meter) and have been calibrated within the last year. All equipment shall be calibrated according to the manufacturer's recommended intervals and following any repairs to the equipment. Calibration tags shall be affixed or certificates readily available.

PART 3 - EXECUTION**3.1 COMMISSIONING PROCESS ROLES AND RESPONSIBILITIES**

- A. The following table outlines the roles and responsibilities for the Commissioning Team members during the Construction Phase:

Construction Phase		CxA = Commissioning Agent RE = Resident Engineer A/E = Design Arch/Engineer PC = Prime Contractor O&M = Gov't Facility O&M					L = Lead P = Participate A = Approve R = Review O = Optional
Commissioning Roles & Responsibilities							
Category	Task Description	CxA	RE	A/E	PC	O&M	Notes
Meetings	Construction Commissioning Kick Off meeting	L	A	P	P	O	
	Commissioning Meetings	L	A	P	P	O	
	Project Progress Meetings	P	A	P	L	O	
	Controls Meeting	L	A	P	P	O	
Coordination	Coordinate with [OGC's, AHJ, Vendors, etc.] to ensure that Cx interacts properly with other systems as needed to support the OPR and BOD.	L	A	P	P	N/A	

Construction Phase		CxA = Commissioning Agent RE = Resident Engineer A/E = Design Arch/Engineer PC = Prime Contractor O&M = Gov't Facility O&M					L = Lead P = Participate A = Approve R = Review O = Optional
Commissioning Roles & Responsibilities							
Category	Task Description	CxA	RE	A/E	PC	O&M	Notes
Cx Plan & Spec	Final Commissioning Plan	L	A	R	R	O	
Schedules	Duration Schedule for Commissioning Activities	L	A	R	R	N/A	
OPR and BOD	Maintain OPR on behalf of Owner	L	A	R	R	O	
	Maintain BOD/DID on behalf of Owner	L	A	R	R	O	
Document Reviews	TAB Plan Review	L	A	R	R	O	
	Submittal and Shop Drawing Review	R	A	R	L	O	
	Review Contractor Equipment Startup Checklists	L	A	R	R	N/A	
	Review Change Orders, ASI, and RFI	L	A	R	R	N/A	

Construction Phase		CxA = Commissioning Agent					L = Lead
Commissioning Roles & Responsibilities		RE = Resident Engineer A/E = Design Arch/Engineer PC = Prime Contractor O&M = Gov’t Facility O&M					P = Participate A = Approve R = Review O = Optional
Category	Task Description	CxA	RE	A/E	PC	O&M	Notes
Site Observations	Witness Factory Testing	P	A	P	L	O	
	Construction Observation Site Visits	L	A	R	R	O	
Functional Test Protocols	Final Pre-Functional Checklists	L	A	R	R	O	
	Final Functional Performance Test Protocols	L	A	R	R	O	
Technical Activities	Issues Resolution Meetings	P	A	P	L	O	
Reports and Logs	Status Reports	L	A	R	R	O	
	Maintain Commissioning Issues Log	L	A	R	R	O	

B. The following table outlines the roles and responsibilities for the Commissioning Team members during the Acceptance Phase:

Acceptance Phase		CxA = Commissioning Agent RE = Resident Engineer A/E = Design Arch/Engineer PC = Prime Contractor O&M = Gov't Facility O&M					L = Lead P = Participate A = Approve R = Review O = Optional
Commissioning Roles & Responsibilities							
Category	Task Description	CxA	RE	A/E	PC	O&M	Notes
Meetings	Commissioning Meetings	L	A	P	P	O	
	Project Progress Meetings	P	A	P	L	O	
	Pre-Test Coordination Meeting	L	A	P	P	O	
	Lessons Learned and Commissioning Report Review Meeting	L	A	P	P	O	
Coordination	Coordinate with [OGC's, AHJ, Vendors, etc.] to ensure that Cx interacts properly with other systems as needed to support OPR and BOD	L	P	P	P	O	
Cx Plan & Spec	Maintain/Update Commissioning Plan	L	A	R	R	O	
Schedules	Prepare Functional Test Schedule	L	A	R	R	O	
OPR and BOD	Maintain OPR on behalf of Owner	L	A	R	R	O	

Acceptance Phase		CxA = Commissioning Agent					L = Lead
Commissioning Roles & Responsibilities		RE = Resident Engineer A/E = Design Arch/Engineer PC = Prime Contractor O&M = Gov’t Facility O&M					P = Participate A = Approve R = Review O = Optional
Category	Task Description	CxA	RE	A/E	PC	O&M	Notes
	Maintain BOD/DID on behalf of Owner	L	A	R	R	O	
Document Reviews	Review Completed Pre-Functional Checklists	L	A	R	R	O	
	Pre-Functional Checklist Verification	L	A	R	R	O	
	Review Operations & Maintenance Manuals	L	A	R	R	R	
	Training Plan Review	L	A	R	R	R	
	Warranty Review	L	A	R	R	O	
	Review TAB Report	L	A	R	R	O	
Site Observations	Construction Observation Site Visits	L	A	R	R	O	
	Witness Selected Equipment Startup	L	A	R	R	O	
Functional Test Protocols	TAB Verification	L	A	R	R	O	
	Systems Functional Performance Testing	L	A	P	P	P	
	Retesting	L	A	P	P	P	
Technical Activities	Issues Resolution Meetings	P	A	P	L	O	
	Systems Training	L	S	R	P	P	
Reports and Logs	Status Reports	L	A	R	R	O	

Acceptance Phase		CxA = Commissioning Agent					L = Lead
Commissioning Roles & Responsibilities		RE = Resident Engineer A/E = Design Arch/Engineer PC = Prime Contractor O&M = Gov’t Facility O&M					P = Participate A = Approve R = Review O = Optional
Category	Task Description	CxA	RE	A/E	PC	O&M	Notes
	Maintain Commissioning Issues Log	L	A	R	R	O	
	Final Commissioning Report	L	A	R	R	R	
	Prepare Systems Manuals	L	A	R	R	R	

C. The following table outlines the roles and responsibilities for the Commissioning Team members during the Warranty Phase:

Warranty Phase		CxA = Commissioning Agent RE = Resident Engineer A/E = Design Arch/Engineer PC = Prime Contractor O&M = Gov’t Facility O&M					L = Lead
Commissioning Roles & Responsibilities							P = Participate
		A = Approve					
		R = Review					
		O = Optional					
Category	Task Description	CxA	RE	A/E	PC	O&M	Notes
Meetings	Post-Occupancy User Review Meeting	L	A	O	P	P	
Site Observations	Periodic Site Visits	L	A	O	O	P	
Functional Test Protocols	Deferred and/or seasonal Testing	L	A	O	P	P	
Technical Activities	Issues Resolution Meetings	L	S	O	O	P	
	Post-Occupancy Warranty Checkup and review of Significant Outstanding Issues	L	A		R	P	
Reports and Logs	Final Commissioning Report Amendment	L	A		R	R	
	Status Reports	L	A		R	R	

3.2 STARTUP, INITIAL CHECKOUT, AND PRE-FUNCTIONAL CHECKLISTS

- A. The following procedures shall apply to all equipment and systems to be commissioned, according to Part 1, Systems to Be Commissioned.
 - 1. Pre-Functional Checklists are important to ensure that the equipment and systems are hooked up and operational. These ensure that Systems Functional Performance Testing may proceed without unnecessary delays. Each system to be commissioned shall have a full Pre-Functional Checklist completed by the Contractor prior to Systems Functional Performance Testing. No sampling strategies are used.
 - a. The Pre-Functional Checklist will identify the trades responsible for completing the checklist. The Contractor shall ensure the appropriate trades complete the checklists.
 - b. The Commissioning Agent will review completed Pre-Functional Checklists and field-verify the accuracy of the completed checklist using sampling techniques.
 - 2. Startup and Initial Checkout Plan: The Contractor shall develop detailed startup plans for all equipment. The primary role of the Contractor in this process is to ensure that there is written documentation that each of the manufacturer recommended procedures have been completed. Parties responsible for startup shall be identified in the Startup Plan and in the checklist forms.
 - a. The Contractor shall develop the full startup plan by combining (or adding to) the checklists with the manufacturer's detailed startup and checkout procedures from the O&M manual data and the field checkout sheets normally used by the Contractor. The plan shall include checklists and procedures with specific boxes or lines for recording and documenting the checking and inspections of each procedure and a summary statement with a signature block at the end of the plan.
 - b. The full startup plan shall at a minimum consist of the following items:
 - 1) The Pre-Functional Checklists.

- 2) The manufacturer's standard written startup procedures copied from the installation manuals with check boxes by each procedure and a signature block added by hand at the end.
 - 3) The manufacturer's normally used field checkout sheets.
- c. The Commissioning Agent will submit the full startup plan to the VA and Contractor for review. Final approval will be by the VA.
- d. The Contractor shall review and evaluate the procedures and the format for documenting them, noting any procedures that need to be revised or added.
3. Sensor and Actuator Calibration
 - a. All field installed temperature, relative humidity, CO2 and pressure sensors and gages, and all actuators (dampers and valves) on all equipment shall be calibrated using the methods described in Division 21, Division 22, Division 23, Division 26, Division 27, and Division 28 specifications.
 - b. All procedures used shall be fully documented on the Pre-Functional Checklists or other suitable forms, clearly referencing the procedures followed and written documentation of initial, intermediate and final results.
4. Execution of Equipment Startup
 - a. Four weeks prior to equipment startup, the Contractor shall schedule startup and checkout with the VA and Commissioning Agent. The performance of the startup and checkout shall be directed and executed by the Contractor.
 - b. The Commissioning Agent will observe the startup procedures for selected pieces of primary equipment.
 - c. The Contractor shall execute startup and provide the VA and Commissioning Agent with a signed and dated copy of the completed startup checklists, and contractor tests.
 - d. Only individuals that have direct knowledge and witnessed that a line item task on the Startup Checklist was actually performed shall initial or check that item off. It is not acceptable for witnessing supervisors to fill out these forms.

3.3 DEFICIENCIES, NONCONFORMANCE, AND APPROVAL IN CHECKLISTS AND STARTUP

- A. The Contractor shall clearly list any outstanding items of the initial startup and Pre-Functional Checklist procedures that were not completed successfully, at the bottom of the procedures form or on an attached sheet. The procedures form and any outstanding deficiencies shall be provided to the VA and the Commissioning Agent within two days of completion.
- B. The Commissioning Agent will review the report and submit comments to the VA. The Commissioning Agent will work with the Contractor to correct and verify deficiencies or uncompleted items. The Commissioning Agent will involve the VA and others as necessary. The Contractor shall correct all areas that are noncompliant or incomplete in the checklists in a timely manner, and shall notify the VA and Commissioning Agent as soon as outstanding items have been corrected. The Contractor shall submit an updated startup report and a Statement of Correction on the original noncompliance report. When satisfactorily completed, the Commissioning Agent will recommend approval of the checklists and startup of each system to the VA.
- C. The Contractor shall be responsible for resolution of deficiencies as directed the VA.

3.4 PHASED COMMISSIONING

- A. The project may require startup and initial checkout to be executed in phases. This phasing shall be planned and scheduled in a coordination meeting of the VA, Commissioning Agent, and the Contractor. Results will be added to the master construction schedule and the commissioning schedule.

3.5 DDC SYSTEM TRENDING FOR COMMISSIONING

- A. Trending is a method of testing as a standalone method or to augment manual testing. The Contractor shall trend any and all points of the system or systems at intervals specified below.
- B. Alarms are a means to notify the system operator that abnormal conditions are present in the system. Alarms shall be structured into three tiers – Critical, Priority, and Maintenance.

1. Critical alarms are intended to be alarms that require the immediate attention of and action by the Operator. These alarms shall be displayed on the Operator Workstation in a popup style window that is graphically linked to the associated unit's graphical display. The popup style window shall be displayed on top of any active window within the screen, including non DDC system software.
 2. Priority level alarms are to be printed to a printer which is connected to the Operator's Work Station located within the engineer's office. Additionally Priority level alarms shall be able to be monitored and viewed through an active alarm application. Priority level alarms are alarms which shall require reaction from the operator or maintenance personnel within a normal work shift, and not immediate action.
 3. Maintenance alarms are intended to be minor issues which would require examination by maintenance personnel within the following shift. These alarms shall be generated in a scheduled report automatically by the DDC system at the start of each shift. The generated maintenance report will be printed to a printer located within the engineer's office.
- C. The Contractor shall provide a wireless internet network in the building for use during controls programming, checkout, and commissioning. This network will allow project team members to more effectively program, view, manipulate and test control devices while being in the same room as the controlled device.
- D. The Contractor shall provide graphical trending through the DDC control system of systems being commissioned. Trending requirements are indicated below and included with the Systems Functional Performance Test Procedures. Trending shall occur before, during and after Systems Functional Performance Testing. The Contractor shall be responsible for producing graphical representations of the trended DDC points that show each system operating properly during steady state conditions as well as during the System Functional Testing. These graphical reports shall be submitted to the Resident Engineer and Commissioning Agent for review and analysis before, during dynamic operation, and after Systems Functional Performance Testing. The Contractor

shall provide, but not limited to, the following trend requirements and trend submissions:

1. Pre-testing, Testing, and Post-testing – Trend reports of trend logs and graphical trend plots are required as defined by the Commissioning Agent. The trend log points, sampling rate, graphical plot configuration, and duration will be dictated by the Commissioning Agent. At any time during the Commissioning Process the Commissioning Agent may recommend changes to aspects of trending as deemed necessary for proper system analysis. The Contractor shall implement any changes as directed by the Resident Engineer. Any pre-test trend analysis comments generated by the Commissioning Team should be addressed and resolved by the Contractor, as directed by the Resident Engineer, prior to the execution of Systems Functional Performance Testing.
2. Dynamic plotting – The Contractor shall also provide dynamic plotting during Systems Functional Performance testing at frequent intervals for points determined by the Systems Functional Performance Test Procedure. The graphical plots will be formatted and plotted at durations listed in the Systems Functional Performance Test Procedure.
3. Graphical plotting - The graphical plots shall be provided with a dual y-axis allowing 15 or more trend points (series) plotted simultaneously on the graph with each series in distinct color. The plots will further require title, axis naming, legend etc. all described by the Systems Functional Performance Test Procedure. If this cannot be sufficiently accomplished directly in the Direct Digital Control System then it is the responsibility of the Contractor to plot these trend logs in Microsoft Excel.
4. The following tables indicate the points to be trended and alarmed by system. The Operational Trend Duration column indicates the trend duration for normal operations. The Testing Trend Duration column indicates the trend duration prior to Systems Functional Performance Testing and again after Systems Functional Performance Testing. The Type column indicates point type: AI = Analog Input, AO = Analog Output, DI = Digital Input, DO = Digital Output, Calc = Calculated Point. In the

Trend Interval Column, COV = Change of Value. The Alarm Type indicates the alarm priority; C = Critical, P = Priority, and M = Maintenance. The Alarm Range column indicates when the point is considered in the alarm state. The Alarm Delay column indicates the length of time the point must remain in an alarm state before the alarm is recorded in the DDC. The intent is to allow minor, short-duration events to be corrected by the DDC system prior to recording an alarm.

Dual-Path Air Handling Unit Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
OA Temperature	AI	15 Min	24 hours	3 days	N/A		
RA Temperature	AI	15 Min	24 hours	3 days	N/A		
RA Humidity	AI	15 Min	24 hours	3 days	P	>60% RH	10 min
Mixed Air Temp	AI	None	None	None	N/A		
SA Temp	AI	15 Min	24 hours	3 days	C	±5°F from SP	10 min
Supply Fan Speed	AI	15 Min	24 hours	3 days	N/A		
Return Fan Speed	AI	15 Min	24 hours	3 days	N/A		
RA Pre-Filter Status	AI	None	None	None	N/A		
OA Pre-Filter Status	AI	None	None	None	N/A		
After Filter Status	AI	None	None	None	N/A		
SA Flow	AI	15 Min	24 hours	3 days	C	±10% from SP	10 min
OA Supply Temp	AI	15 Min	24 hours	3 days	P	±5°F from SP	10 min
RA Supply Temp	AI	15 Min	24 hours	3 days	N/A		
RA CHW Valve Position	AI	15 Min	24 hours	3 days	N/A		
OA CHW Valve Position	AI	15 Min	24 hours	3 days	N/A		
OA HW Valve Position	AI	15 Min	24 hours	3 days	N/A		

Dual-Path Air Handling Unit Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
OA Flow	AI	15 Min	24 hours	3 days	P	±10% from SP	5 min
RA Flow	AI	15 Min	24 hours	3 days	P	±10% from SP	5 min
Initial UVC Intensity (%)	AI	None	None	None	N/A		
Duct Pressure	AI	15 Min	24 hours	3 days	C	±25% from SP	6 min
CO2 Level	AI	15 Min	24 hours	3 days	P	±10% from SP	10 min
Supply Fan Status	DI	COV	24 hours	3 days	C	Status <> Command	10 min
Return Fan Status	DI	COV	24 hours	3 days	C	Status <> Command	10 Min
High Static Status	DI	COV	24 hours	3 days	P	True	1 min
Fire Alarm Status	DI	COV	24 hours	3 days	C	True	5 min
Freeze Stat Level 1	DI	COV	24 hours	3 days	C	True	10 min
Freeze Stat Level 2	DI	COV	24 hours	3 days	C	True	5 min
Freeze Stat Level 3	DI	COV	24 hours	3 days	P	True	1 min
Fire/Smoke Damper Status	DI	COV	24 hours	3 days	P	Closed	1 min
Emergency AHU Shutdown	DI	COV	24 hours	3 days	P	True	1 min
Exhaust Fan #1 Status	DI	COV	24 hours	3 days	C	Status <> Command	10 min
Exhaust Fan #2 Status	DI	COV	24 hours	3 days	C	Status <> Command	10 min

Dual-Path Air Handling Unit Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Exhaust Fan #3 Status	DI	COV	24 hours	3 days	C	Status <> Command	10 min
OA Alarm	DI	COV	24 hours	3 days	C	True	10 min
High Static Alarm	DI	COV	24 hours	3 days	C	True	10 min
UVC Emitter Alarm	DI	COV	24 hours	3 days	P	True	10 min
CO2 Alarm	DI	COV	24 hours	3 days	P	True	10 min
Power Failure	DI	COV	24 hours	3 days	P	True	1 min
Supply Fan Speed	AO	15 Min	24 hours	3 days	N/A		
Return Fan Speed	AO	15 Min	24 hours	3 days	N/A		
RA CHW Valve Position	AO	15 Min	24 hours	3 days	N/A		
OA CHW Valve Position	AO	15 Min	24 hours	3 days	N/A		
OA HW Valve Position	AO	15 Min	24 hours	3 days	N/A		
Supply Fan S/S	DO	COV	24 hours	3 days	N/A		
Return Fan S/S	DO	COV	24 hours	3 days	N/A		
Fire/Smoke Dampers	DO	COV	24 hours	3 days	N/A		
Exhaust Fan S/S	DO	COV	24 hours	3 days	N/A		
Exhaust Fan S/S	DO	COV	24 hours	3 days	N/A		
Exhaust Fan S/S	DO	COV	24 hours	3 days	N/A		
AHU Energy	Calc	1 Hour	30 day	N/A	N/A		

Terminal Unit (VAV, CAV, etc.) Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Space Temperature	AI	15 Min	12 hours	3 days	P	±5°F from SP	10 min
Air Flow	AI	15 Min	12 hours	3 days	P	±5°F from SP	10 min
SA Temperature	AI	15 Min	12 hours	3 days	P	±5°F from SP	10 min
Local Setpoint	AI	15 Min	12 hours	3 days	M	±10°F from SP	60 min
Space Humidity	AI	15 Min	12 hours	3 days	P	> 60% RH	5 min
Unoccupied Override	DI	COV	12 hours	3 days	M	N/A	12 Hours
Refrigerator Alarm	DI	COV	12 hours	3 days	C	N/A	10 min
Damper Position	AO	15 Minutes	12 hours	3 days	N/A		
Heating coil Valve Position	AO	15 Minutes	12 hours	3 days	N/A		

4-Pipe Fan Coil Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Space Temperature	AI	15 Minutes	12 hours	3 days	P	±5°F from SP	10 min
SA Temperature	AI	15 Minutes	12 hours	3 days	P	±5°F from SP	10 min
Pre-Filter Status	AI	None	None	None	M	> SP	1 hour
Water Sensor	DI	COV	12 hours	3 days	M	N/A	30 Min
Cooling Coil Valve Position	AO	15 Minutes	12 hours	3 days	N/A		

4-Pipe Fan Coil Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Heating coil Valve Position	AO	15 Minutes	12 hours	3 days	N/A		
Fan Coil ON/OFF	DO	COV	12 hours	3 days	M	Status <> Command	30 min

2-Pipe Fan Coil Unit Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Space Temperature	AI	15 Minutes	12 hours	3 days	P	±5°F from SP	10 min
SA Temperature	AI	15 Minutes	12 hours	3 days	P	±5°F from SP	10 min
Pre-Filter Status	AI	None	None	None	M	> SP	1 hour
Water Sensor	DI	COV	12 hours	3 days	M	N/A	30 Min
Cooling Coil Valve Position	AO	15 Minutes	12 hours	3 days	N/A		
Fan Coil ON/OFF	DO	COV	12 hours	3 days	M	Status <> Command	30 min

Unit Heater Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Space Temperature	AI	15 Minutes	12 hours	3 days	P	±5°F from SP	10 min
Heating Valve Position	AO	15 Minutes	12 hours	3 days	N/A		
Unit Heater ON/OFF	DO	COV	12 hours	3 days	M	Status <> Command	30 min

Steam and Condensate Pumps Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Steam Flow (LB/HR)	AI	15 Minutes	12 hours	3 days	N/A		
Condensate Pump Run Hours	AI	15 Minutes	12 hours	3 days	N/A		
Water Meter (GPM)	AI	15 Minutes	12 hours	3 days	N/A		
Electric Meter (KW/H)	AI	15 Minutes	12 hours	3 days	N/A		
Irrigation Meter (GPM)	AI	15 Minutes	12 hours	3 days	N/A		
Chilled Water Flow (TONS)	AI	15 Minutes	12 hours	3 days	N/A		
Condensate Flow (GPM)	AI	15 Minutes	12 hours	3 days	N/A		
High Water Level Alarm	DI	COV	12 hours	3 days	C	True	5 Min

Steam and Condensate Pumps Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Condensate Pump Start/Stop	DO	COV	12 hours	3 days	P	Status <> Command	10 min

Domestic Hot Water Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Domestic HW Setpoint WH-1	AI	15 Minute	12 Hours	3 days	N/A		
Domestic HW Setpoint WH-2	AI	15 Minute	12 Hours	3 days	N/A		
Domestic HW Temperature	AI	15 Minute	12 Hours	3 days	C	> 135 oF	10 Min
Domestic HW Temperature	AI	15 Minute	12 Hours	3 days	P	±5°F from SP	10 Min
Dom. Circ. Pump #1 Status	DI	COV	12 Hours	3 days	M	Status <> Command	30 min
Dom. Circ. Pump #2 Status	DI	COV	12 Hours	3 days	M	Status <> Command	30 min
Dom. Circ. Pump #1 Start/Stop	DO	COV	12 Hours	3 days	N/A		
Dom. Circ. Pump #2 Start/Stop	DO	COV	12 Hours	3 days	N/A		
Domestic HW Start/Stop	DO	COV	12 Hours	3 days	N/A		

Hydronic Hot Water Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
System HWS Temperature	AI	15 min	12 hours	3 days	C	±5°F from SP	10 Min
System HWR Temperature	AI	15 min	12 hours	3 days	M	±15°F from SP	300 Min
HX-1 Entering Temperature	AI	15 min	12 hours	3 days	P	±5°F from SP	10 Min
HX-2 Entering Temperature	AI	15 min	12 hours	3 days	P	±5°F from SP	10 Min
HX-2 Leaving Temperature	AI	15 min	12 hours	3 days	P	±5°F from SP	10 Min
System Flow (GPM)	AI	15 min	12 hours	3 days	N/A		
System Differential Pressure	AI	15 min	12 hours	3 days	P	±10% from SP	8 Min
				3 days			
HW Pump 1 Status	DI	COV	12 Hours	3 days	C	Status <> Command	30 min
HW Pump 2 Status	DI	COV	12 Hours	3 days	C	Status <> Command	30 min
HW Pump 1 VFD Speed	AO	15 Min	12 Hours	3 days	N/A		
HW Pump 2 VFD Speed	AO	15 Min	12 Hours	3 days	N/A		
Steam Station #1 1/3 Control Valve Position	AO	15 Min	12 Hours	3 days	N/A		
Steam Station #1 2/3 Control Valve Position	AO	15 Min	12 Hours	3 days	N/A		
Steam Station #2 1/3 Control Valve Position	AO	15 Min	12 Hours	3 days	N/A		

Hydronic Hot Water Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Steam Station #2 2/3 Control Valve Position	AO	15 Min	12 Hours	3 days	N/A		
Steam Station Bypass Valve Position	AO	15 Min	12 Hours	3 days	N/A		
HW Pump 1 Start/Stop	DO	COV	12 Hours	3 days	N/A		
HW Pump 2 Start/Stop	DO	COV	12 Hours	3 days	N/A		
HWR #1 Valve	DO	COV	12 Hours	3 days	N/A		
HWR #2 Valve	DO	COV	12 Hours	3 days	N/A		

Chilled Water System Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Chiller 1 Entering Temperature	AI	15 Minutes	12 Hours	3 days	N/A		
Chiller 1 Leaving Temperature	AI	15 Minutes	12 Hours	3 days	P	±5°F from SP	10 Min
Chiller 1 Flow	AI	15 Minutes	12 Hours	3 days	N/A		
Chiller 1 Percent Load	AI	15 Minutes	12 Hours	3 days	N/A		
Chiller 1 KW Consumption	AI	15 Minutes	12 Hours	3 days	N/A		
Chiller 1 Tonnage	AI	15 Minutes	12 Hours	3 days	N/A		
Chiller 2 Entering Temperature	AI	15 Minutes	12 Hours	3 days	N/A		

Chilled Water System Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Chiller 2 Leaving Temperature	AI	15 Minutes	12 Hours	3 days	P	±5°F from SP	10 Min
Chiller 2 Flow	AI	15 Minutes	12 Hours	3 days	N/A		
Chiller 2 Percent Load	AI	15 Minutes	12 Hours	3 days	N/A		
Chiller 2 KW Consumption	AI	15 Minutes	12 Hours	3 days	N/A		
Chiller 2 Tonnage	AI	15 Minutes	12 Hours	3 days	N/A		
Primary Loop Decoupler Flow	AI	15 Minutes	12 Hours	3 days	N/A		
Primary Loop Flow	AI	15 Minutes	12 Hours	3 days	N/A		
Primary Loop Supply Temperature	AI	15 Minutes	12 Hours	3 days	N/A		
Secondary Loop Differential Pressure	AI	15 Minutes	12 Hours	3 days	P	±5% from SP	10 Min
Secondary Loop Flow	AI	15 Minutes	12 Hours	3 days	N/A		
Secondary Loop Supply Temperature	AI	15 Minutes	12 Hours	3 days	N/A		
Secondary Loop Return Temperature	AI	15 Minutes	12 Hours	3 days	N/A		
Secondary Loop Tonnage	AI	15 Minutes	12 Hours	3 days	N/A		
Primary Loop Pump 1 Status	DI	COV	12 Hours	3 days	C	Status <> Command	30 min
Primary Loop Pump 2 Status	DI	COV	12 Hours	3 days	C	Status <> Command	30 min

Chilled Water System Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Secondary Loop Pump 1 Status	DI	COV	12 Hours	3 days	C	Status <> Command	30 min
Secondary Loop Pump 2 Status	DI	COV	12 Hours	3 days	C	Status <> Command	30 min
Chiller 1 Status	DI	COV	12 Hours	3 days	C	Status <> Command	30 min
Chiller 1 Evaporator Iso-Valve	DI	COV	12 Hours	3 days	N/A		
Chiller 1 Evaporator Flow Switch	DI	COV	12 Hours	3 days	N/A		
Chiller 1 Unit Alarm	DI	COV	12 Hours	3 days	C	True	10 Min
Chiller 2 Status	DI	COV	12 Hours	3 days	C	Status <> Command	30 min
Chiller 2 Evaporator Iso-Valve	DI	COV	12 Hours	3 days	N/A		
Chiller 2 Evaporator Flow Switch	DI	COV	12 Hours	3 days	N/A		
Chiller 2 Unit Alarm	DI	COV	12 Hours	3 days	C	True	10 Min
Refrigerant Detector	DI	COV	12 Hours	3 days	C	True	10 Min
Refrigerant Exhaust Fan Status	DI	COV	12 Hours	3 days	M	Status <> Command	30 min
Emergency Shutdown	DI	COV	12 Hours	3 days	P	True	1 Min

Chilled Water System Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Primary Loop Pump 1 VFD Speed	AO	15 Minutes	12 Hours	3 days	N/A		
Primary Loop Pump 2 VFD Speed	AO	15 Minutes	12 Hours	3 days	N/A		
Secondary Loop Pump 1 VFD Speed	AO	15 Minutes	12 Hours	3 days	N/A		
Secondary Loop Pump 2 VFD Speed	AO	15 Minutes	12 Hours	3 days	N/A		
Primary Pump 1 Start / Stop	DO	COV	12 Hours	3 days	N/A		
Primary Pump 2 Start / Stop	DO	COV	12 Hours	3 days	N/A		
Secondary Pump 1 Start / Stop	DO	COV	12 Hours	3 days	N/A		
Secondary Pump 2 Start / Stop	DO	COV	12 Hours	3 days	N/A		
Chiller 1 Enable	DO	COV	12 Hours	3 days	N/A		
Chiller 1 Iso-Valve Command	DO	COV	12 Hours	3 days	N/A		
Chiller 2 Enable	DO	COV	12 Hours	3 days	N/A		
Chiller 2 Iso-Valve Command	DO	COV	12 Hours	3 days	N/A		
Refrigerant Exhaust Fan Start / Stop	DO	COV	12 Hours	3 days	N/A		

Condenser Water System Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Chiller 1 Condenser Entering Temp	AI	15 Minutes	12 Hours	3 days	N/A		
Chiller 1 Condenser Leaving Temp	AI	15 Minutes	12 Hours	3 days	N/A		
Chiller 2 Condenser Entering Temp	AI	15 Minutes	12 Hours	3 days	N/A		
Chiller 2 Condenser Leaving Temp	AI	15 Minutes	12 Hours	3 days	N/A		
Cooling Tower 1 Supply Temp	AI	15 Minutes	12 Hours	3 days	N/A		
Cooling Tower 1 Return Temp	AI	15 Minutes	12 Hours	3 days	N/A		
Cooling Tower 1 Basin Temp	AI	15 Minutes	12 Hours	3 days	P	< 45 oF	10 Min
Cooling Tower 2 Supply Temp	AI	15 Minutes	12 Hours	3 days	N/A		
Cooling Tower 2 Return Temp	AI	15 Minutes	12 Hours	3 days	N/A		
Cooling Tower 2 Basin Temp	AI	15 Minutes	12 Hours	3 days	P	< 45 oF	10 Min
Condenser Water Supply Temp	AI	15 Minutes	12 Hours	3 days	N/A		
Condenser Water Return Temp	AI	15 Minutes	12 Hours	3 days	N/A		
Outdoor Air Wet Bulb	AI	15 Minutes	12 Hours	3 days	N/A		
Cooling Tower 1 Fan Status	DI	COV	12 Hours	3 days	P	Status <> Command	1 min

Condenser Water System Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Cooling Tower 1 Basin Heat	DI	COV	12 Hours	3 days	N/A		
Cooling Tower 1 Heat Trace	DI	COV	12 Hours	3 days	N/A		
Cooling Tower 2 Fan Status	DI	COV	12 Hours	3 days	P	Status <> Command	1 min
Cooling Tower 2 Basin Heat	DI	COV	12 Hours	3 days	N/A		
Cooling Tower 2 Heat Trace	DI	COV	12 Hours	3 days	N/A		
Chiller 1 Isolation Valve	DI	COV	12 Hours	3 days	P	Status <> Command	1 min
Chiller 2 Isolation Valve	DI	COV	12 Hours	3 days	P	Status <> Command	1 min
Condenser Water Pump 1 Status	DI	COV	12 Hours	3 days	P	Status <> Command	1 min
Condenser Water Pump 2 Status	DI	COV	12 Hours	3 days	P	Status <> Command	1 min
Chiller 1 Condenser Bypass Valve	AO	15 Minutes	12 Hours	3 days	N/A		
Chiller 2 Condenser By-Pass Valve	AO	15 Minutes	12 Hours	3 days	N/A		
Cooling Tower 1 Bypass Valve	AO	15 Minutes	12 Hours	3 days	N/A		
Cooling Tower 1 Fan Speed	AO	15 Minutes	12 Hours	3 days	N/A		
Cooling Tower 2 Bypass Valve	AO	15 Minutes	12 Hours	3 days	N/A		

Condenser Water System Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Cooling Tower 2 Fan Speed	AO	15 Minutes	12 Hours	3 days	N/A		
Cooling Tower 1 Fan Start / Stop	DO	COV	12 Hours	3 days	N/A		
Cooling Tower 2 Fan Start / Stop	DO	COV	12 Hours	3 days	N/A		
Condenser Water Pump 1 Start / Stop	DO	COV	12 Hours	3 days	N/A		
Condenser Water Pump 2 Start / Stop	DO	COV	12 Hours	3 days	N/A		

Steam Boiler System Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Boiler 1 Steam Pressure	AI	15 Minutes	12 Hours	3 days	P	±5% from SP	10 Min
Boiler 1 Steam Temperature	AI	15 Minutes	12 Hours	3 days	N/A		
Boiler 1 Fire Signal	AI	15 Minutes	12 Hours	3 days	N/A		
Boiler 2 Steam Pressure	AI	15 Minutes	12 Hours	3 days	P	±5% from SP	10 Min
Boiler 2 Steam Temperature	AI	15 Minutes	12 Hours	3 days	N/A		
Boiler 2 Fire Signal	AI	15 Minutes	12 Hours	3 days	N/A		
System Steam Pressure	AI	15 Minutes	12 Hours	3 days	P	±5% from SP	10 Min
Boiler 1 Enable	DI	COV	12 Hours	3 days	N/A		

Steam Boiler System Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Boiler 1 Status	DI	COV	12 Hours	3 days	P	Status <> Command	10 min
Boiler 1 Alarm	DI	COV	12 Hours	3 days	C	True	1 Min
Boiler 1 on Fuel Oil	DI	COV	12 Hours	3 days	N/A		
Boiler 1 Low Water Alarm	DI	COV	12 Hours	3 days	C	True	5 Min
Boiler 1 High Water Alarm	DI	COV	12 Hours	3 days	C	True	5 Min
Boiler 1 Feed Pump	DI	COV	12 Hours	3 days	N/A		
Boiler 2 Enable	DI	COV	12 Hours	3 days	N/A		
Boiler 2 Status	DI	COV	12 Hours	3 days	P	Status <> Command	10 min
Boiler 2 Alarm	DI	COV	12 Hours	3 days	C	True	1 Min
Boiler 2 on Fuel Oil	DI	COV	12 Hours	3 days	N/A		
Boiler 2 Low Water Alarm	DI	COV	12 Hours	3 days	C	True	5 Min
Boiler 2 High Water Alarm	DI	COV	12 Hours	3 days	C	True	5 Min
Boiler 2 Feed Pump	DI	COV	12 Hours	3 days	N/A		
Combustion Damper Status	DI	COV	12 Hours	3 days	P	Status <> Command	5 min
Condensate Recovery Pump Status	DI	COV	12 Hours	3 days	P	Status <> Command	5 min
Boiler 1 Feed Pump Start / Stop	DO	COV	12 Hours	3 days	N/A		
Boiler 2 Start / Stop	DO	COV	12 Hours	3 days	N/A		

Steam Boiler System Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Combustion Damper Command	DO	COV	12 Hours	3 days	N/A		
Condensate Recovery Pump Start / Stop	DO	COV	12 Hours	3 days	N/A		

Hot Water Boiler System Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Outside Air Temperature	AI	15 Minutes	12 Hours	3 days	N/A		
Boiler 1 Fire Signal	AI	15 Minutes	12 Hours	3 days	N/A		
Boiler 1 Entering Water Temperature	AI	15 Minutes	12 Hours	3 days	N/A		
Boiler 1 Leaving Water Temperature	AI	15 Minutes	12 Hours	3 days	N/A		
Boiler 2 Fire Signal	AI	15 Minutes	12 Hours	3 days	N/A		
Boiler 2 Entering Water Temperature	AI	15 Minutes	12 Hours	3 days	N/A		
Boiler 2 Leaving Water Temperature	AI	15 Minutes	12 Hours	3 days	N/A		

Hot Water Boiler System Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Hot Water Supply Temperature	AI	15 Minutes	12 Hours	3 days	P	±5 of from SP	10 Min
Hot Water Return Temperature	AI	15 Minutes	12 Hours	3 days	N/A		
Secondary Loop Differential Pressure	AI	15 Minutes	12 Hours	3 days	C	±5% from SP	10 Min
Lead Boiler	AI	15 Minutes	12 Hours	3 days	N/A		
Boiler 1 Enable	DI	COV	12 Hours	3 days	N/A		
Boiler 1 Status	DI	COV	12 Hours	3 days	P	Status <> Command	10 min
Boiler 1 Isolation Valve	DI	COV	12 Hours	3 days	N/A		
Boiler 1 on Fuel Oil	DI	COV	12 Hours	3 days	N/A		
Boiler 1 Alarm	DI	COV	12 Hours	3 days	C	True	1 Min
Boiler 2 Enable	DI	COV	12 Hours	3 days	N/A		
Boiler 2 Status	DI	COV	12 Hours	3 days	P	Status <> Command	10 min
Boiler 2 Isolation Valve	DI	COV	12 Hours	3 days	N/A		
Boiler 2 on Fuel Oil	DI	COV	12 Hours	3 days	N/A		
Boiler 2 Alarm	DI	COV	12 Hours	3 days	C	True	1 Min
Combustion Dampers Open	DI	COV	12 Hours	3 days	P	Status <> Command	10 min
Primary Pump 1 Status	DI	COV	12 Hours	3 days	P	Status <> Command	10 min

Hot Water Boiler System Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Primary Pump 2 Status	DI	COV	12 Hours	3 days	P	Status <> Command	10 min
Secondary Pump 1 Status	DI	COV	12 Hours	3 days	P	Status <> Command	10 min
Secondary Pump 2 Status	DI	COV	12 Hours	3 days	P	Status <> Command	10 min
Primary Pump 1 VFD Speed	AO	COV	12 Hours	3 days	N/A		
Primary Pump 2 VFD Speed	AO	COV	12 Hours	3 days	N/A		
Secondary Pump 1 VFD Speed	AO	COV	12 Hours	3 days	N/A		
Secondary Pump 2 VFD Speed	AO	COV	12 Hours	3 days	N/A		
Hot Water System Enable	DO	COV	12 Hours	3 days	N/A		
Combustion Dampers Command	DO	COV	12 Hours	3 days	N/A		
Primary Pump 1 Start / Stop	DO	COV	12 Hours	3 days	N/A		
Primary Pump 2 Start / Stop	DO	COV	12 Hours	3 days	N/A		
Secondary Pump 1 Start / Stop	DO	COV	12 Hours	3 days	N/A		
Secondary Pump 2 Start / Stop	DO	COV	12 Hours	3 days	N/A		

- E. The Contractor shall provide the following information prior to Systems Functional Performance Testing. Any documentation that is modified after submission shall be recorded and resubmitted to the Resident Engineer and Commissioning Agent.
1. Point-to-Point checkout documentation;
 2. Sensor field calibration documentation including system name, sensor/point name, measured value, DDC value, and Correction Factor.
 3. A sensor calibration table listing the referencing the location of procedures to following in the O&M manuals, and the frequency at which calibration should be performed for all sensors, separated by system, subsystem, and type. The calibration requirements shall be submitted both in the O&M manuals and separately in a standalone document containing all sensors for inclusion in the commissioning documentation. The following table is a sample that can be used as a template for submission.

SYSTEM		
Sensor	Calibration Frequency	O&M Calibration Procedure Reference
Discharge air temperature	Once a year	Volume I Section D.3.aa
Discharge static pressure	Every 6 months	Volume II Section A.1.c

4. Loop tuning documentation and constants for each loop of the building systems. The documentation shall be submitted in outline or table separated by system, control type (e.g. heating valve temperature control); proportional, integral and derivative constants, interval (and bias if used) for each loop. The following table is a sample that can be used as a template for submission.

AIR HANDLING UNIT AHU-1

Control Reference	Proportional Constant	Integral Constant	Derivative Constant	Interval
Heating Valve Output	1000	20	10	2 sec.

3.6 SYSTEMS FUNCTIONAL PERFORMANCE TESTING

- A. This paragraph applies to Systems Functional Performance Testing of systems for all referenced specification Divisions.
- B. Objectives and Scope: The objective of Systems Functional Performance Testing is to demonstrate that each system is operating according to the Contract Documents. Systems Functional Performance Testing facilitates bringing the systems from a state of substantial completion to full dynamic operation. Additionally, during the testing process, areas of noncompliant performance are identified and corrected, thereby improving the operation and functioning of the systems. In general, each system shall be operated through all modes of operation (seasonal, occupied, unoccupied, warm-up, cool-down, part- and full-load, fire alarm and emergency power) where there is a specified system response. The Contractor shall verify each sequence in the sequences of operation. Proper responses to such modes and conditions as power failure, freeze condition, low oil pressure, no flow, equipment failure, etc. shall also be tested.
- C. Development of Systems Functional Performance Test Procedures: Before Systems Functional Performance Test procedures are written, the Contractor shall submit all requested documentation and a current list of change orders affecting equipment or systems, including an updated points list, program code, control sequences and parameters. Using the testing parameters and requirements found in the Contract Documents and approved submittals and shop drawings, the Commissioning Agent will develop specific Systems Functional Test Procedures to verify and document proper operation of each piece of equipment and system to be commissioned. The Contractor shall assist the Commissioning Agent in developing the Systems Functional Performance Test procedures as requested by the Commissioning Agent i.e. by answering questions

about equipment, operation, sequences, etc. Prior to execution, the Commissioning Agent will provide a copy of the Systems Functional Performance Test procedures to the VA, the Architect/Engineer, and the Contractor, who shall review the tests for feasibility, safety, equipment and warranty protection.

D. Purpose of Test Procedures: The purpose of each specific Systems Functional Performance Test is to verify and document compliance with the stated criteria of acceptance given on the test form. Representative test formats and examples are found in the Commissioning Plan for this project. (The Commissioning Plan is issued as a separate document and is available for review.) The test procedure forms developed by the Commissioning Agent will include, but not be limited to, the following information:

1. System and equipment or component name(s)
2. Equipment location and ID number
3. Unique test ID number, and reference to unique Pre-Functional Checklists and startup documentation, and ID numbers for the piece of equipment
4. Date
5. Project name
6. Participating parties
7. A copy of the specification section describing the test requirements
8. A copy of the specific sequence of operations or other specified parameters being verified
9. Formulas used in any calculations
10. Required pretest field measurements
11. Instructions for setting up the test.
12. Special cautions, alarm limits, etc.
13. Specific step-by-step procedures to execute the test, in a clear, sequential and repeatable format
14. 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.

15. A section for comments.
 16. Signatures and date block for the Commissioning Agent. A place for the Contractor to initial to signify attendance at the test.
- E. Test Methods: Systems Functional Performance Testing shall be achieved by manual testing (i.e. persons manipulate the equipment and observe performance) and/or by monitoring the performance and analyzing the results using the control system's trend log capabilities or by standalone data loggers. The Contractor and Commissioning Agent shall determine which method is most appropriate for tests that do not have a method specified.
1. Simulated Conditions: Simulating conditions (not by an overwritten value) shall be allowed, although timing the testing to experience actual conditions is encouraged wherever practical.
 2. Overwritten Values: Overwriting sensor values to simulate a condition, such as overwriting the outside air temperature reading in a control system to be something other than it really is, shall be allowed, but shall be used with caution and avoided when possible. Such testing methods often can only test a part of a system, as the interactions and responses of other systems will be erroneous or not applicable. Simulating a condition is preferable. e.g., for the above case, by heating the outside air sensor with a hair blower rather than overwriting the value or by altering the appropriate setpoint to see the desired response. Before simulating conditions or overwriting values, sensors, transducers and devices shall have been calibrated.
 3. Simulated Signals: Using a signal generator which creates a simulated signal to test and calibrate transducers and DDC constants is generally recommended over using the sensor to act as the signal generator via simulated conditions or overwritten values.
 4. Altering Setpoints: Rather than overwriting sensor values, and when simulating conditions is difficult, altering setpoints to test a sequence is acceptable. For example, to see the Air Conditioning compressor lockout initiate at an outside air

- temperature below 12 C (54 F), when the outside air temperature is above 12 C (54 F), temporarily change the lockout setpoint to be 2 C (4 F) above the current outside air temperature.
5. Indirect Indicators: Relying on indirect indicators for responses or performance shall be allowed only after visually and directly verifying and documenting, over the range of the tested parameters, that the indirect readings through the control system represent actual conditions and responses. Much of this verification shall be completed during systems startup and initial checkout.
- F. Setup: Each function and test shall be performed under conditions that simulate actual conditions as closely as is practically possible. The Contractor shall provide all necessary materials, system modifications, etc. to produce the necessary flows, pressures, temperatures, etc. necessary to execute the test according to the specified conditions. At completion of the test, the Contractor shall return all affected building equipment and systems, due to these temporary modifications, to their pretest condition.
- G. Sampling: No sampling is allowed in completing Pre-Functional Checklists. Sampling is allowed for Systems Functional Performance Test Procedures execution. The Commissioning Agent will determine the sampling rate. If at any point, frequent failures are occurring and testing is becoming more troubleshooting than verification, the Commissioning Agent may stop the testing and require the Contractor to perform and document a checkout of the remaining units, prior to continuing with Systems Functional Performance Testing of the remaining units.
- H. Cost of Retesting: The cost associated with expanded sample System Functional Performance Tests shall be solely the responsibility of the Contractor. Any required retesting by the Contractor shall not be considered a justified reason for a claim of delay or for a time extension by the Contractor.
- I. Coordination and Scheduling: The Contractor shall provide a minimum of 7 days' notice to the Commissioning Agent and the VA regarding the completion schedule for the Pre-Functional Checklists and startup of all equipment and systems. The Commissioning Agent will schedule Systems Functional Performance Tests with the Contractor and VA.

The Commissioning Agent will witness and document the Systems Functional Performance Testing of systems. The Contractor shall execute the tests in accordance with the Systems Functional Performance Test Procedure.

- J. Testing Prerequisites: In general, Systems Functional Performance Testing will be conducted only after Pre-Functional Checklists have been satisfactorily completed. The control system shall be sufficiently tested and approved by the Commissioning Agent and the VA before it is used to verify performance of other components or systems. The air balancing and water balancing shall be completed before Systems Functional Performance Testing of air-related or water-related equipment or systems are scheduled. Systems Functional Performance Testing will proceed from components to subsystems to systems. When the proper performance of all interacting individual systems has been achieved, the interface or coordinated responses between systems will be checked.
- K. Problem Solving: The Commissioning Agent will recommend solutions to problems found, however the burden of responsibility to solve, correct and retest problems is with the Contractor.

3.7 DOCUMENTATION, NONCONFORMANCE AND APPROVAL OF TESTS

- A. Documentation: The Commissioning Agent will witness, and document the results of all Systems Functional Performance Tests using the specific procedural forms developed by the Commissioning Agent for that purpose. Prior to testing, the Commissioning Agent will provide these forms to the VA and the Contractor for review and approval. The Contractor shall include the filled out forms with the O&M manual data.
- B. Nonconformance: The Commissioning Agent will record the results of the Systems Functional Performance Tests on the procedure or test form. All items of nonconformance issues will be noted and reported to the VA on Commissioning Field Reports and/or the Commissioning Master Issues Log.
 - 1. Corrections of minor items of noncompliance identified may be made during the tests. In such cases, the item of noncompliance and resolution shall be documented on the Systems Functional Test Procedure.

2. Every effort shall be made to expedite the systems functional Performance Testing process and minimize unnecessary delays, while not compromising the integrity of the procedures. However, the Commissioning Agent shall not be pressured into overlooking noncompliant work or loosening acceptance criteria to satisfy scheduling or cost issues, unless there is an overriding reason to do so by direction from the VA.
3. As the Systems Functional Performance Tests progresses and an item of noncompliance is identified, the Commissioning Agent shall discuss the issue with the Contractor and the VA.
4. When there is no dispute on an item of noncompliance, and the Contractor accepts responsibility to correct it:
 - a. The Commissioning Agent will document the item of noncompliance and the Contractor's response and/or intentions. The Systems Functional Performance Test then continues or proceeds to another test or sequence. After the day's work is complete, the Commissioning Agent will submit a Commissioning Field Report to the VA. The Commissioning Agent will also note items of noncompliance and the Contractor's response in the Master Commissioning Issues Log. The Contractor shall correct the item of noncompliance and report completion to the VA and the Commissioning Agent.
 - b. The need for retesting will be determined by the Commissioning Agent. If retesting is required, the Commissioning Agent and the Contractor shall reschedule the test and the test shall be repeated.
5. If there is a dispute about item of noncompliance, regarding whether it is an item of noncompliance, or who is responsible:
 - a. The item of noncompliance shall be documented on the test form with the Contractor's response. The item of noncompliance with the Contractor's response shall also be reported on a Commissioning Field Report and on the Master Commissioning Issues Log.

- b. Resolutions shall be made at the lowest management level possible. Other parties are brought into the discussions as needed. Final interpretive and acceptance authority is with the Department of Veterans Affairs.
 - c. The Commissioning Agent will document the resolution process.
 - d. Once the interpretation and resolution have been decided, the Contractor shall correct the item of noncompliance, report it to the Commissioning Agent. The requirement for retesting will be determined by the Commissioning Agent. If retesting is required, the Commissioning Agent and the Contractor shall reschedule the test. Retesting shall be repeated until satisfactory performance is achieved.
- C. Cost of Retesting: The cost to retest a System Functional Performance Test shall be solely the responsibility of the Contractor. Any required retesting by the Contractor shall not be considered a justified reason for a claim of delay or for a time extension by the Contractor.
- D. Failure Due to Manufacturer Defect: If 10%, or three, whichever is greater, of identical pieces (size alone does not constitute a difference) of equipment fail to perform in compliance with the Contract Documents (mechanically or substantively) due to manufacturing defect, not allowing it to meet its submitted performance specifications, all identical units may be considered unacceptable by the VA. In such case, the Contractor shall provide the VA with the following:
 - 1. Within one week of notification from the VA, the Contractor shall examine all other identical units making a record of the findings. The findings shall be provided to the VA within two weeks of the original notice.
 - 2. Within two weeks of the original notification, the Contractor shall provide a signed and dated, written explanation of the problem, cause of failures, etc. and all proposed solutions which shall include full equipment submittals. The proposed

- solutions shall not significantly exceed the specification requirements of the original installation.
3. The VA shall determine whether a replacement of all identical units or a repair is acceptable.
 4. Two examples of the proposed solution shall be installed by the Contractor and the VA shall be allowed to test the installations for up to one week, upon which the VA will decide whether to accept the solution.
 5. Upon acceptance, the Contractor shall replace or repair all identical items, at their expense and extend the warranty accordingly, if the original equipment warranty had begun. The replacement/repair work shall proceed with reasonable speed beginning within one week from when parts can be obtained.
- E. Approval: The Commissioning Agent will note each satisfactorily demonstrated function on the test form. Formal approval of the Systems Functional Performance Test shall be made later after review by the Commissioning Agent and by the VA. The Commissioning Agent will evaluate each test and report to the VA using a standard form. The VA will give final approval on each test using the same form, and provide signed copies to the Commissioning Agent and the Contractor.

3.8 DEFERRED TESTING

- A. Unforeseen Deferred Systems Functional Performance Tests: If any Systems Functional Performance Test cannot be completed due to the building structure, required occupancy condition or other conditions, execution of the Systems Functional Performance Testing may be delayed upon approval of the VA. These Systems Functional Performance Tests shall be conducted in the same manner as the seasonal tests as soon as possible. Services of the Contractor to conduct these unforeseen Deferred Systems Functional Performance Tests shall be negotiated between the VA and the Contractor.
- B. Deferred Seasonal Testing: Deferred Seasonal Systems Functional Performance Tests are those that must be deferred until weather conditions are closer to the systems design parameters. The Commissioning Agent will review systems parameters and

recommend which Systems Functional Performance Tests should be deferred until weather conditions more closely match systems parameters. The Contractor shall review and comment on the proposed schedule for Deferred Seasonal Testing. The VA will review and approve the schedule for Deferred Seasonal Testing. Deferred Seasonal Systems Functional Performances Tests shall be witnessed and documented by the Commissioning Agent. Deferred Seasonal Systems Functional Performance Tests shall be executed by the Contractor in accordance with these specifications.

3.9 OPERATION AND MAINTENANCE TRAINING REQUIREMENTS

- A. Training Preparation Conference: Before operation and maintenance training, the Commissioning Agent will convene a training preparation conference to include VA's Resident Engineer, VA's Operations and Maintenance personnel, and the Contractor. The purpose of this conference will be to discuss and plan for Training and Demonstration of VA Operations and Maintenance personnel.
- B. The Contractor shall provide training and demonstration as required by other Division 21, Division 22, Division 23, Division 26, Division 27, Division 28, and Division 31 sections. The Training and Demonstration shall include, but is not limited to, the following:
 - 1. Review the Contract Documents.
 - 2. Review installed systems, subsystems, and equipment.
 - 3. Review instructor qualifications.
 - 4. Review instructional methods and procedures.
 - 5. Review training module outlines and contents.
 - 6. Review course materials (including operation and maintenance manuals).
 - 7. Review and discuss locations and other facilities required for instruction.
 - 8. Review and finalize training schedule and verify availability of educational materials, instructors, audiovisual equipment, and facilities needed to avoid delays.
 - 9. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

- C. Training Module Submittals: The Contractor shall submit the following information to the VA and the Commissioning Agent:
1. Instruction Program: Submit two copies of outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module. At completion of training, submit two complete training manuals for VA's use.
 2. Qualification Data: Submit qualifications for facilitator and/or instructor.
 3. Attendance Record: For each training module, submit list of participants and length of instruction time.
 4. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.
 5. Demonstration and Training Recording:
 - a. General: Engage a qualified commercial photographer to record demonstration and training. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice. At beginning of each training module, record each chart containing learning objective and lesson outline.
 - b. Video Format: Provide high quality color DVD color on standard size DVD disks.
 - c. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to show area of demonstration and training. Display continuous running time.
 - d. Narration: Describe scenes on video recording by audio narration by microphone while demonstration and training is recorded. Include description of items being viewed. Describe vantage point, indicating location, direction (by compass point), and elevation or story of construction.
 - e. Submit two copies within seven days of end of each training module.
 6. Transcript: Prepared on 8-1/2-by-11-inch paper, punched and bound in heavy-duty, 3-ring, vinyl-covered binders. Mark appropriate identification on front and spine of

each binder. Include a cover sheet with same label information as the corresponding videotape. Include name of Project and date of videotape on each page.

D. Quality Assurance:

1. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.
2. Instructor Qualifications: A factory authorized service representative, complying with requirements in Division 01 Section "Quality Requirements," experienced in operation and maintenance procedures and training.
3. Photographer Qualifications: A professional photographer who is experienced photographing construction projects.

E. Training Coordination:

1. Coordinate instruction schedule with VA's operations. Adjust schedule as required to minimize disrupting VA's operations.
2. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
3. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by the VA.

F. Instruction Program:

1. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections, and as follows:
 - a. Fire protection systems, including fire alarm, fire pumps, and fire suppression systems.
 - b. Intrusion detection systems.

- c. Conveying systems, including elevators, wheelchair lifts, escalators, and automated materials handling systems.
 - d. Medical equipment, including medical gas equipment and piping.
 - e. Laboratory equipment, including laboratory air and vacuum equipment and piping.
 - f. Heat generation, including boilers, feedwater equipment, pumps, steam distribution piping, condensate return systems, heating hot water heat exchangers, and heating hot water distribution piping.
 - g. Refrigeration systems, including chillers, cooling towers, condensers, pumps, and distribution piping.
 - h. HVAC systems, including air handling equipment, air distribution systems, and terminal equipment and devices.
 - i. HVAC instrumentation and controls.
 - j. Electrical service and distribution, including switchgear, transformers, switchboards, panelboards, uninterruptible power supplies, and motor controls.
 - k. Packaged engine generators, including synchronizing switchgear/switchboards, and transfer switches.
 - l. Lighting equipment and controls.
 - m. Communication systems, including intercommunication, surveillance, nurse call systems, public address, mass evacuation, voice and data, and entertainment television equipment.
 - n. Site utilities including lift stations, condensate pumping and return systems, and storm water pumping systems.
- G. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participants are expected to master. For each module, include instruction for the following:
- 1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
 - a. System, subsystem, and equipment descriptions.

- b. Performance and design criteria if Contractor is delegated design responsibility.
 - c. Operating standards.
 - d. Regulatory requirements.
 - e. Equipment function.
 - f. Operating characteristics.
 - g. Limiting conditions.
 - H, Performance curves.
2. Documentation: Review the following items in detail:
- a. Emergency manuals.
 - b. Operations manuals.
 - c. Maintenance manuals.
 - d. Project Record Documents.
 - e. Identification systems.
 - f. Warranties and bonds.
 - g. Maintenance service agreements and similar continuing commitments.
3. Emergencies: Include the following, as applicable:
- a. Instructions on meaning of warnings, trouble indications, and error messages.
 - b. Instructions on stopping.
 - c. Shutdown instructions for each type of emergency.
 - d. Operating instructions for conditions outside of normal operating limits.
 - e. Sequences for electric or electronic systems.
 - f. Special operating instructions and procedures.
4. Operations: Include the following, as applicable:
- a. Startup procedures.
 - b. Equipment or system break-in procedures.
 - c. Routine and normal operating instructions.
 - d. Regulation and control procedures.
 - e. Control sequences.
 - f. Safety procedures.

- g. Instructions on stopping.
 - h. Normal shutdown instructions.
 - i. Operating procedures for emergencies.
 - j. Operating procedures for system, subsystem, or equipment failure.
 - k. Seasonal and weekend operating instructions.
 - l. Required sequences for electric or electronic systems.
 - m. Special operating instructions and procedures.
5. Adjustments: Include the following:
- a. Alignments.
 - b. Checking adjustments.
 - c. Noise and vibration adjustments.
 - d. Economy and efficiency adjustments.
6. Troubleshooting: Include the following:
- a. Diagnostic instructions.
 - b. Test and inspection procedures.
7. Maintenance: Include the following:
- a. Inspection procedures.
 - b. Types of cleaning agents to be used and methods of cleaning.
 - c. List of cleaning agents and methods of cleaning detrimental to product.
 - d. Procedures for routine cleaning
 - e. Procedures for preventive maintenance.
 - f. Procedures for routine maintenance.
 - g. Instruction on use of special tools.
8. Repairs: Include the following:
- a. Diagnosis instructions.
 - b. Repair instructions.
 - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - d. Instructions for identifying parts and components.

e. Review of spare parts needed for operation and maintenance.

H. Training Execution:

1. Preparation: Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual. Set up instructional equipment at instruction location.
2. Instruction:
 - a. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Department of Veterans Affairs for number of participants, instruction times, and location.
 - b. Instructor: Engage qualified instructors to instruct VA's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
 - 1) The Commissioning Agent will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
 - 2) The VA will furnish an instructor to describe VA's operational philosophy.
 - 3) The VA will furnish the Contractor with names and positions of participants.
3. Scheduling: Provide instruction at mutually agreed times. For equipment that requires seasonal operation, provide similar instruction at start of each season. Schedule training with the VA and the Commissioning Agent with at least seven days' advance notice.
4. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of an oral, or a written, performance-based test.
5. Cleanup: Collect used and leftover educational materials and remove from Project site. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

I. Demonstration and Training Recording:

1. General: Engage a qualified commercial photographer to record demonstration and training. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice. At beginning of each training module, record each chart containing learning objective and lesson outline.
2. Video Format: Provide high quality color DVD color on standard size DVD disks.
3. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to show area of demonstration and training. Display continuous running time.
4. Narration: Describe scenes on videotape by audio narration by microphone while demonstration and training is recorded. Include description of items being viewed. Describe vantage point, indicating location, direction (by compass point), and elevation or story of construction.

----- END -----

**SECTION 02 41 00
DEMOLITION**

PART 1- GENERAL

1.1 DESCRIPTION:

This section specifies demolition and removal of buildings, portions of buildings, utilities, other structures and debris from trash dumps shown.

1.2 RELATED WORK:

- A. Demolition and removal of roads, walks, curbs, and on-grade slabs outside buildings to be demolished: Section 31 20 00, EARTH MOVING
- B. Safety Requirements: Section 01 35 26 Safety Requirements Article, ACCIDENT PREVENTION PLAN (APP).
- C. Disconnecting utility services prior to demolition: Section 01 00 00, GENERAL REQUIREMENTS.
- D. Reserved items that are to remain the property of the Government: Section 01 00 00, GENERAL REQUIREMENTS.
- H. Construction Waste Management: Section 01 74 19 CONSTRUCTION WASTE MANAGEMENT.

1.3 PROTECTION:

- A. Perform demolition in such manner as to eliminate hazards to persons and property; to minimize interference with use of adjacent areas, utilities and structures or interruption of use of such utilities; and to provide free passage to and from such adjacent areas of structures. Comply with requirements of GENERAL CONDITIONS Article, ACCIDENT PREVENTION.
- B. Provide safeguards, including warning signs, barricades, temporary fences, warning lights, and other similar items that are required for protection of all personnel during demolition and removal operations. Comply with requirements of Section 01 00 00, GENERAL REQUIREMENTS, Article PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES AND IMPROVEMENTS.

- C. Maintain fences, barricades, lights, and other similar items around exposed excavations until such excavations have been completely filled.
- D. Provide enclosed dust chutes with control gates from each floor to carry debris to truck beds and govern flow of material into truck. Provide overhead bridges of tight board or prefabricated metal construction at dust chutes to protect persons and property from falling debris.
- E. Prevent spread of flying particles and dust. Sprinkle rubbish and debris with water to keep dust to a minimum. Do not use water if it results in hazardous or objectionable condition such as, but not limited to; ice, flooding, or pollution. Vacuum and dust the work area daily.
- F. In addition to previously listed fire and safety rules to be observed in performance of work, include following:
 - 1. No wall or part of wall shall be permitted to fall outwardly from structures.
 - 2. Maintain at least one stairway in each structure in usable condition to highest remaining floor. Keep stairway free of obstructions and debris until that level of structure has been removed.
 - 3. Wherever a cutting torch or other equipment that might cause a fire is used, provide and maintain fire extinguishers nearby ready for immediate use. Instruct all possible users in use of fire extinguishers.
 - 4. Keep hydrants clear and accessible at all times. Prohibit debris from accumulating within a radius of 4500 mm (15 feet) of fire hydrants.
- G. Before beginning any demolition work, the Contractor shall survey the site and examine the drawings and specifications to determine the extent of the work. The contractor shall take necessary precautions to avoid damages to existing items to remain in place, to be reused, or to remain the property of the Medical Center; any damaged items shall be repaired or replaced as approved by the Resident Engineer. The Contractor shall coordinate the work of this section with all other work and shall construct and maintain shoring, bracing, and supports as required. The Contractor shall ensure that structural elements are not overloaded and shall be responsible for increasing structural supports

or adding new supports as may be required as a result of any cutting, removal, or demolition work performed under this contract. Do not overload structural elements. Provide new supports and reinforcement for existing construction weakened by demolition or removal works. Repairs, reinforcement, or structural replacement must have Resident Engineer's approval.

- H. The work shall comply with the requirements of Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS.
- I. The work shall comply with the requirements of Section 01 00 00, GENERAL REQUIREMENTS and Section 01 35 26, SAFETY REQUIREMENTS.

1.4 UTILITY SERVICES:

- A. Demolish and remove outside utility service lines shown to be removed.
- B. Remove abandoned outside utility lines that would interfere with installation of new utility lines and new construction.

PART 2- PRODUCTS (NOT USED)

PART 3- EXECUTION

3.1 DEMOLITION:

- A. Completely demolish and remove buildings and structures, including all appurtenances related or connected thereto, as noted below:
 - 1. As required for installation of new utility service lines.
 - 2. To full depth within an area defined by hypothetical lines located 1500 mm (5 feet) outside building lines of new structures.
- B. Debris, including brick, concrete, stone, metals and similar materials shall become property of Contractor and shall be disposed of by him daily, off the Medical Center to avoid accumulation at the demolition site. Materials that cannot be removed daily shall be stored in areas specified by the Resident Engineer. Break up concrete slabs below grade that do not require removal from present location into pieces not exceeding 600 mm (24 inches) square to permit drainage. Contractor shall dispose debris in compliance with applicable federal, state or local permits, rules and/or regulations.

- C. In removing buildings and structures of more than two stories, demolish work story by story starting at highest level and progressing down to third floor level. Demolition of first and second stories may proceed simultaneously.
- D. Remove and legally dispose of all materials, other than earth to remain as part of project work, from any trash dumps shown. Materials removed shall be hauled to VA specified disposal site . All materials in the indicated trash dump areas, including above surrounding grade and extending to a depth of 1500mm (5feet) below surrounding grade, shall be included as part of the lump sum compensation for the work of this section. Materials that are located beneath the surface of the surrounding ground more than 1500 mm (5 feet), or materials that are discovered to be hazardous, shall be handled as unforeseen. The removal of hazardous material shall be referred to Hazardous Materials specifications.
- E. Remove existing utilities as indicated or uncovered by work and terminate in a manner conforming to the nationally recognized code covering the specific utility and approved by the Resident Engineer. When Utility lines are encountered that are not indicated on the drawings, the Resident Engineer shall be notified prior to further work in that area.

3.2 CLEAN-UP:

On completion of work of this section and after removal of all debris, leave site in clean condition satisfactory to Resident Engineer. Clean-up shall include off the Medical Center disposal of all items and materials not required to remain property of the Government as well as all debris and rubbish resulting from demolition operations.

--- E N D ---

**SECTION 033000
CAST-IN-PLACE CONCRETE**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.
- B. Related Requirements:
 - 1. NOT USED
 - 2. NOT USED
 - 3. NOT USED
 - 4. NOT USED
 - 5. NOT USED
 - 6. NOT USED

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.
- B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:

- a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete manufacturer.
 - d. Concrete Subcontractor.
 - e. Special concrete finish Subcontractor.
2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semirigid joint fillers, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation and concrete protection.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. NOT USED
- C. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
 1. Indicate amounts of mixing water to be withheld for later addition at Project site.
- D. Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
- E. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
 1. Location of construction joints is subject to approval of the Architect.
- F. Samples: For vapor retarder.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer, manufacturer and testing agency.
- B. Welding certificates.
- C. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Form materials and form-release agents.
4. Steel reinforcement and accessories.
5. Fiber reinforcement.
6. Curing compounds.
7. Floor and slab treatments.
8. Bonding agents.
9. Adhesives.
10. Vapor retarders.
11. Semirigid joint filler.
12. Joint-filler strips.
13. Repair materials.

D. Material Test Reports: For the following, from a qualified testing agency:

1. Aggregates: Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.

E. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer, detailing fabrication, assembly, and support of formwork.

1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and reshoring installation and removal.

F. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.

G. Field quality-control reports.

H. Minutes of preinstallation conference.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

- C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
 - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
 - 2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician, Grade II.
- D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M.
- E. Mockups: Cast concrete slab-on-grade panels to demonstrate typical joints, surface finish, texture, tolerances, floor treatments, and standard of workmanship.
 - 1. Build panel approximately 200 sq. ft. for slab-on-grade in the location indicated or, if not indicated, as directed by Architect.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on concrete mixtures.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.
- B. NOT USED

1.10 FIELD CONDITIONS

- A. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - 1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.

2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- B. Hot-Weather Placement: Comply with ACI 301 and as follows:
1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

- A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
1. ACI 301.
 2. ACI 117.

2.2 NOT USED

2.3 STEEL REINFORCEMENT

- A. NOT USED
- B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- C. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.
- D. NOT USED.
- E. NOT USED.
- F. NOT USED.
- G. Steel Bar Mats: ASTM A 184/A 184M, fabricated from ASTM A 615/A 615M, Grade 60, deformed bars, assembled with clips.

- H. NOT USED.
- I. NOT USED.
- J. NOT USED.
- K. NOT USED.
- L. NOT USED.
- M. NOT USED.
- N. NOT USED.

2.4 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.
- B. NOT USED.
- C. NOT USED.
- D. NOT USED.
- E. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 - 1. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
 - 2. NOT USED.
 - 3. NOT USED.

2.5 CONCRETE MATERIALS

- A. NOT USED
- B. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
- C. Cementitious Materials:

1. Portland Cement: ASTM C 150/C 150M, Type I, Type III, gray.
 2. Fly Ash: ASTM C 618, Class F.
 3. NOT USED.
 4. NOT USED.
 5. NOT USED.
- D. Normal-Weight Aggregates: ASTM C 33/C 33M, coarse aggregate or better, graded. Provide aggregates from a single source.
1. Maximum Coarse-Aggregate Size:
 - a. Three-fourths of the minimum clear spacing between reinforcing bars.
 - b. One-fifth of the narrowest dimension between the sides of the forms.
 - c. One-third of the thickness of the slabs or toppings.
 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- E. NOT USED.
- F. Air-Entraining Admixture: ASTM C 260/C 260M.
- G. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.
- H. Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete and complying with ASTM C 494/C 494M, Type C.
1. Products
 - a. Axim Italcementi Group, Inc.; CATEXOL CN-CI.
 - b. BASF Construction Chemicals – Building Systems; Rheocrete CNI.
 - c. Euclid Chemical Company (The); Eucon, CIA.
 - d. Grace Construction Products, W.R. Grace & Co.; DCI.
 - e. Sika Corporation; Sika CNI.

- I. Non-Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, non-set-accelerating, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.
 - 1. Products
 - a. BASF Construction Chemicals – Building Systems; Rheocrete 222+.
 - b. Cortec Corporation; MCI [2000] [2005NS].
 - c. Grace Construction Products, W.R. Grace & Co.; DCI-S.
 - d. Sika Corporation; FerroGard-901.
- J. NOT USED.
- K. Water: ASTM C 94/C 94M and potable.

2.6 NOT USED

2.7 NOT USED

2.8 VAPOR RETARDERS

- A. Sheet Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.
 - 1. Products
 - a. Fortifiber Building Systems Group; Moistop Ultra 15
 - b. Meadows, W.R., Inc; Perminator 15 mil.
 - c. Raven Industries Inc.; Vapor Block 15.
 - d. Reef Industries, Inc; Griffolyn 15 Green
 - e. Stego Industries, LLC; Stego Wrap 15 mil Class A.
- B. NOT USED.
- C. NOT USED.
- D. NOT USED.
- E. NOT USED.

2.9 NOT USED

2.10 LIQUID FLOOR TREATMENTS

- A. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.

2.11 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.
- D. NOT USED.
- E. NOT USED.
- F. NOT USED.
- G. NOT USED.
- H. NOT USED.

2.12 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.
- B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 according to ASTM D 2240.
- C. Bonding Agent: ASTM C 1059/C 1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.
- D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:

1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- E. NOT USED.
- F. NOT USED.

2.13 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
 1. Cement Binder: ASTM C 150/C 150M, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
 4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.
- B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.
 1. Cement Binder: ASTM C 150/C 150M, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
 4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109/C 109M.

2.14 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
 - 1. Fly Ash: 25 percent.
 - 2. Combined Fly Ash and Pozzolan: 25 percent.
 - 3. Slag Cement: 50 percent.
 - 4. Combined Fly Ash or Pozzolan and Slag Cement: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.
 - 5. Silica Fume: 10 percent.
 - 6. Combined Fly Ash, Pozzolans, and Silica Fume: 35 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.
 - 7. Combined Fly Ash or Pozzolans, Slag Cement, and Silica Fume: 50 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.
- C. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement.
- D. Admixtures: Use admixtures according to manufacturer's written instructions.
 - 1. Use water-reducing, high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
 - 2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 - 3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a w/c ratio below 0.50.
 - 4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.
- E. NOT USED

2.15 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Footings: Concrete mix design shall comply with the requirements of the structural drawings.
- B. Foundation Walls: Concrete mix design shall comply with the requirements of the structural drawings.
- C. Slabs-on-Grade: Concrete mix design shall comply with the requirements of the structural drawings.
- D. NOT USED.

- E. NOT USED
- F. NOT USED
- G. NOT USED
- H. NOT USED

2.16 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.17 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.
 - 1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.
 - 1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
 - 2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd.
 - 3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 FORMWORK INSTALLATION

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
 - 1. Class A, 1/8 inch for smooth-formed finished surfaces.
 - 2. Class B, 1/4 inch for rough-formed finished surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Construct forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 1. Install keyways, reglets, recesses, and the like, for easy removal.
 - 2. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer exterior corners and edges of permanently exposed concrete.
- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEM INSTALLATION

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.
 - 2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
 - 3. Install dovetail anchor slots in concrete structures as indicated.

3.3 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations, and curing and protection operations need to be maintained.
 - 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
 - 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material are not acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 SHORING AND RESHORING INSTALLATION

- A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.
 - 1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.

- B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.
- C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.5 VAPOR-RETARDER INSTALLATION

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.
 - 1. Lap joints 6 inches and seal with manufacturer's recommended tape.
- B. Bituminous Vapor Retarders: Place, protect, and repair bituminous vapor retarder according to manufacturer's written instructions.

3.6 STEEL REINFORCEMENT INSTALLATION

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
 - 1. Weld reinforcing bars according to AWS D1.4/D 1.4M, where indicated.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded-wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

- F. Epoxy-Coated Reinforcement: Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963/D 3963M. Use epoxy-coated steel wire ties to fasten epoxy-coated steel reinforcement.
- G. Zinc-Coated Reinforcement: Repair cut and damaged zinc coatings with zinc repair material according to ASTM A 780/A 780M. Use galvanized-steel wire ties to fasten zinc-coated steel reinforcement.

3.7 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 - 2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
 - 3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 - 4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 - 5. Space vertical joints in walls at 30 feet on center. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
 - 6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 - 7. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: as indicated in structural drawings.
- D. Isolation Joints in Slabs-on-Grade: as indicated in structural drawings.
- E. Doweled Joints: as indicated in structural drawings..

3.8 NOT USED

3.9 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.
- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
 - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 - 1. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
 - 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
 - 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 - 1. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 2. Maintain reinforcement in position on chairs during concrete placement.
 - 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 - 4. Slope surfaces uniformly to drains where required.
 - 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

3.10 NOT USED

3.11 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction.
 - 1. Apply scratch finish to surfaces to receive concrete floor toppings.
- C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
 - 1. Apply float finish to surfaces to receive trowel finish.
- D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 - 1. Apply a trowel finish to surfaces exposed to view.
 - 2. Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:
 - a. NOT USED
 - b. Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on-grade.
 - c. Specified overall values of flatness, F(F) 30; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 15; for suspended slabs.
 - d. NOT USED
 - 3. Finish and measure surface, so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.- long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/4 inch.

- E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thinset method. While concrete is still plastic, slightly scarify surface with a fine broom.
 - 1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.
- F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.
 - 1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.
- G. NOT USED
- H. NOT USED

3.12 MISCELLANEOUS CONCRETE ITEM INSTALLATION

- A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations:
 - 1. Coordinate sizes and locations of concrete bases with actual equipment provided.
 - 2. Construct concrete bases as required by the equipment manufacturer.
 - 3. Minimum Compressive Strength: as required by the equipment manufacturer.
 - 4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
 - 5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete substrate.
 - 6. Prior to pouring concrete, place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 7. Cast anchor-bolt insert into bases. Install anchor bolts to elevations required for proper attachment to supported equipment.
- D. NOT USED

3.13 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for remainder of curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
 - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
 - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
 - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies does not interfere with bonding of floor covering used on Project.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.
4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.14 LIQUID FLOOR TREATMENT APPLICATION

- A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.
 1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
 2. Do not apply to concrete that is less than seven days' old.
 3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.
- B. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer's written instructions.

3.15 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
 1. Defer joint filling until concrete has aged at least six months. Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.

- C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.16 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 - 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 - 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar matches surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 - 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
 - 1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 - 2. After concrete has cured at least 14 days, correct high areas by grinding.
 - 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.

4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.17 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
- C. Inspections:
1. Steel reinforcement placement.
 2. Steel reinforcement welding.
 3. Headed bolts and studs.
 4. Verification of use of required design mixture.

5. Concrete placement, including conveying and depositing.
 6. Curing procedures and maintenance of curing temperature.
 7. Verification of concrete strength before removal of shores and forms from beams and slabs.
- D. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172/C 172M shall be performed according to the following requirements:
1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
 2. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.
 - a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 3. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
 4. Air Content: ASTM C 231/C 231M, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 5. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.
 6. Unit Weight: ASTM C 567/C 567M, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 7. Compression Test Specimens: ASTM C 31/C 31M.
 - a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
 - b. Cast and field cure not required.
 8. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
 - a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
 - b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
 10. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
 11. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
 12. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
 13. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
 14. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
 15. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.
- E. Measure floor and slab flatness and levelness according to ASTM E 1155 within 24 hours of finishing.

3.18 PROTECTION OF LIQUID FLOOR TREATMENTS

- A. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.

END OF SECTION 033000

SECTION 03 45 00
PRECAST ARCHITECTURAL CONCRETE

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section includes the performance criteria, materials, production, and erection of architectural precast concrete cladding units. The work performed under this section includes all labor, material, equipment, related services, and supervision required for the manufacture and erection of the architectural precast concrete work shown on the construction documents.

1.2 RELATED WORK

- A. Section 01 45 29, TESTING LABORATORY SERVICES: Materials testing and inspection during construction.
- B. Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS: Sustainable Design Requirements.
- C. Section 03 30 00, CAST-IN-PLACE CONCRETE: Concrete.
- D. Section 03 41 33, PRECAST STRUCTURAL PRETENSIONED CONCRETE: Precast pre-stressed structural building elements.
- E. Section 04 05 13, MASONRY MORTARING: Mortar.
- F. Section 04 20 00, UNIT MASONRY: Masonry Facing.
- G. Section 07 21 13, THERMAL INSULATION: Insulation for Insulated Panels.
- H. Section 07 92 00, JOINT SEALANTS: Sealants and Caulking.
- I. Section 09 06 00, SCHEDULE FOR FINISHES: Size, Type and Color of Aggregate for Exposed Aggregate Finish and Matrix Color.
- J. Section 09 91 00, PAINTING: Repair of Abraded Galvanized and Painted Surfaces.

1.3 QUALITY ASSURANCE

- A. Fabricator Qualifications: A firm that complies with PCI MNL 117 and the following requirements and is experienced in producing units similar to those indicated for this Project and with a record of successful in-service performance:

1. Participates in PCI's Plant Certification program at the time of bidding and is designated a PCI-certified plant for Group A, Category A1- Architectural Cladding and Load Bearing Units. Submit PCI certification.
 2. Fabricator must have a minimum of three (3) years' experience in Precast Architectural Concrete work comparable to that shown and specified in not less than three (3) projects of similar scope.
- B. Erector Qualifications:
1. A precast concrete erector Qualified by the Precast/Prestressed Concrete Institute (PCI) prior to beginning work at the project site. Submit a current Certificate of Compliance furnished by PCI designating qualification in Category A (Architectural Systems) for non-load-bearing members. Submit qualifications.
- C. Testing Laboratory Accreditation Requirements: Construction materials testing laboratories must be accredited by a laboratory accreditation authority. Submit a copy of the Certificate of Accreditation and Scope of Accreditation.
- D. Quality-Control Standard: For manufacturing procedures and testing requirements, quality-control recommendations, and dimensional tolerances for types of units required, comply with PCI MNL 117.
- E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01, GENERAL REQUIREMENTS.

1.4 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide units and connections capable of withstanding: the design criteria specified on the construction documents, self-weights and weights of materials supported or attached, for the conditions indicated.
1. Design Standards: Comply with ACI 318/ACI 318M and the design recommendations of PCI MNL 120 and PCI MNL 122 applicable to types of units indicated.
 2. Limit deflection of precast members as follows:
 - a. Vertical live load – Span / 360.
 - b. Wind load – Height / 400.
 3. Physical Security Life Safety Protected Facilities:

- a. Precast concrete panels to meet or exceed the design and construction standards as provided in the Physical Security Design Manual for VA Facilities: Life Safety Protected.
 - 1) Blast Resistance: Design level threat W1, W2 located at the standoff distance, but not greater than GP1, GP2. Submit calculations for review and approval prepared by qualified blast consultant, with a minimum of 5 years experience in design of blast resistant systems. The magnitudes of the design threats are defined in the Physical Security Design Standards Data Definitions which is a document separate from the referenced VA Security Design Manual. The Physical Security Design Standards Data Definitions are on a need to know basis by the blast/structural engineer performing the blast design on VA projects. It is the responsibility of the engineer of blast resistant system to request and obtain the Physical Security Design Data Standard Data Definitions from the VA Office of Construction and Facilities Management (CFM). Any associated delays or increased costs due to failure to obtain this information will be borne by the contractor
- B. Design concrete units and connections to maintain clearances at openings, to allow for fabrication and construction tolerances, to accommodate live load deflection, shrinkage and creep of primary building structure, and other building movements.
- C. Thermal Movements: Provide for in-plane thermal movements resulting from annual ambient temperature changes of 120 degrees F.
- D. Calculated Fire-Test-Response Characteristics: Where indicated, provide units whose fire resistance has been calculated according to PCI MNL 124.

1.5 SOURCE QUALITY CONTROL

- A. Quality-Control Testing: Test and inspect precast concrete according to Section 01 45 29, TESTING LABORATORY SERVICES and PCI MNL 117 requirements respectively. If using self-consolidating concrete also test and inspect according to PCI TR-6.
- B. Testing: When determined by the COR that there is evidence that the concrete strength of precast concrete units may be deficient, employ an independent testing agency at

Contractor's expense to obtain, prepare, and test cores drilled from hardened concrete to determine compressive strength according to PCI MNL 117:

1. Submit test results in writing on the same day that tests are performed, with copies to COR, Contractor, and precast concrete fabricator. Include the information required in Section 01 45 29, TESTING LABORATORY SERVICES and the following:
 - a. Identification mark and type of precast concrete units represented by core tests; design compressive strength; type of break; compressive strength at breaks, corrected for length-diameter ratio; and direction of applied load to core in relation to horizontal plane of concrete as placed.
- C. Defective or Damaged Work: Units that do not comply with acceptability requirements, including concrete strength, manufacturing tolerances, and color and texture range are unacceptable. Chipped, spalled or cored units may be repaired, if repaired units match the visual mock-up. The COR will reject units that do not match the accepted samples and visual mock-up. Remove unacceptable units from the site and replace with precast concrete units that comply with requirements.

1.6 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Sustainable Design Submittals, as described below:
 1. Postconsumer and preconsumer recycled content as specified in PART 2 - PRODUCTS.
- C. Design Mixes: For each concrete mix along with compressive strength and water-absorption tests.
- D. Shop (Erection) Drawings: Detail fabrication and installation of units.
 1. Indicate member locations with distinctive marks that match marks placed on the panels. Provide plans, elevations, dimensions, corner details, shapes, cross sections and relationships to adjacent materials.
 2. Indicate aesthetic characteristics including joints, reveals, and extent and location of each surface finish.
 3. Indicate separate face and backup mix locations, and thicknesses. Indicate locations, extent and treatment of dry joints if two-stage casting is proposed.

4. Indicate welded connections by AWS standard symbols. Detail loose and cast-in hardware, and connections.
5. Indicate locations, tolerances and details of anchorage devices to be embedded in or attached to structure or other construction.
6. Indicate sequence of erection.
7. Indicate locations and details of facing materials, anchors, and joint widths.
8. Design Modifications:
 - a. If design modifications are necessary to meet the performance requirements and field conditions, submit design calculations and drawings. Do not adversely affect the appearance, durability or strength of units when modifying details or materials and maintain the general design concept.
- E. Samples: Design reference samples for initial verification of design intent, approximately 305 by 305 by 50 mm (12 by 12 by 2 inches), representative of finishes, color, and textures of exposed surfaces of units.
- F. Welding Certificates: Copies of certificates for welding procedure specifications (WPS) and personnel.
- G. Qualification Data for fabricator, erector, and professional engineer: List of completed projects with project names and addresses, names and addresses of COR and owners, and PCI Certification documentation.
- H. Testing laboratory accreditations.
- I. Material Test Reports: From an accredited testing agency indicating and interpreting test results of the following for compliance with requirements indicated:
 1. Concrete strengths and mix designs.
- J. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements.
 1. Cementitious materials.
 2. Reinforcing materials and prestressing tendons.
 3. Admixtures.
 4. Bearing pads.

- 5. Structural-steel shapes and hollow structural sections.
- 6. Insulation
- 7. Facing units.
- 8. Anchors.
- K. Description of stone anchor shear and tensile test assembly.
- L. Certificate of Compliance.
- M. Erectors Post Audit Declaration.

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Comply with product handling requirements of PCI MNL 117 at the plant and project site.
- B. Deliver all units to the project site in such quantities and at such times to assure compliance with the agreed project schedule and proper setting sequence so as to limit unloading units temporarily on the ground.
- C. Lift and support units only at designated points shown on the shop drawings.
- D. Furnish loose connection hardware and anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, templates, instructions, and directions, as required, for installation.
- E. Store units with adequate dunnage and bracing, and protect units to prevent contact with soil to prevent staining, and to prevent cracking, distortion, warping, and other physical damage. Place stored units so identification marks are clearly visible for inspection.

1.8 WARRANTY

- A. Construction Warranty: Comply with FAR clause 52.246-21 "Warranty of Construction".

1.9 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of specification to extent referenced. Publications are referenced in text by basic designation only.
- B. ASTM International (ASTM):
 - A27/A27M-20.....Standard Specification for Steel Castings, Carbon, for General Application
 - A36/A36M-19.....Standard Specification for Carbon Structural Steel
 - A47/A47M-99(2018)e1Standard Specification for Ferritic Malleable Iron Castings

A108-18.....	Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished
A123/A123M-17	Standard Specifications for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
A153/A153M-16a.....	Standard Specifications for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
A184/A184M-19	Standard Specification for Welded Deformed Steel Bar mats for Concrete Reinforcement
A240/A240M-20.....	Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and For General Applications
A276/A276M-17	Standard Specification for Stainless Steel Bars and Shapes
A283/A283M-18	Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates
A307-14e1.....	Standard Specifications for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength
A416/A416M-18	Standard Specification for Low-relaxation, Seven-Wire Steel Strand for Prestressed Concrete
A500/A500M-20	Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
A563-15.....	Standard Specification for Carbon and Alloy Steel Nuts
A563M-07(R2013).....	Carbon and Alloy Steel Nuts (Metric)
A572/A572M-18	Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel
A615/A615M-20	Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement
A666-15.....	Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar

A675/A675M-14(2019)	Standard Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality, Mechanical Properties
A706/A706M-16	Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement
A767/A767M-19	Standard Specification for Zinc Coated (Galvanized) Steel Bars for Concrete Reinforcement
A775/A775M-19	Standard Specification for Epoxy Coated Steel Reinforcing Bars
A780/A780M-20	Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
A884/A884M-19	Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Fabric for Reinforcement
A934/A934M-19	Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars
A1064/A1064M-18a.....	Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
B633-19	Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel
C33/C33M-18.....	Standard Specification for Concrete Aggregates
C40/C40M-20.....	Standard Test Method for Organic Impurities in Fine Aggregate for Concrete
C144-18	Standard Specification for Aggregate for Masonry Mortar
C150/C150M-20.....	Standard Specification for Portland Cement
C260/C260M-10a(2016)	Standard Specification for Air Entraining Admixtures for Concrete
C330/C330M-17a.....	Standard Specification for Lightweight Aggregates for Structural Concrete
C373-18	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
C494/C494M-19	Standard Specification for Chemical Admixtures for Concrete
C618-19	Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
C881/C881M-20	Standard Specification for Epoxy Resin Base Bonding Systems for Concrete
C920-18	Standard Specification for Elastomeric Joint Sealants
C979/C979M-16	Standard Specification for Pigments for Integrally Colored Concrete
C989/C989M-18a	Standard Specification for Slag Cement for Use in Concrete and Mortars.
C1017/C1017M-13e1	Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete
C1107/1107M-20	Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-shrink)
C1218/C1218M-20	Standard Test Method for Water-Soluble Chloride in Mortar and Concrete
C1240-20	Standard Specification for Silica Fume Used in Cementitious Mixtures
C1354/C1354M-15	Standard Test Method for Strength of Individual Stone Anchorages in Dimension Stone
D412—16	Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers – Tension
D2240-15e1	Standard Test Method for Rubber Property—Durometer Hardness
D4397-16	Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications

- E165/E165M-18Standard Practice for Liquid Penetrant Testing for General Industry
- E488/E488M-18Standard Test Methods for Strength of Anchors in Concrete Elements
- E709-15Standard Guide for Magnetic Particle Testing
- F436/F436M-19Standard Specification for Hardened Steel Washers, Inch and Metric Dimensions
- F593-17Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs
- F844-07a(R2013).....Standard Specification for Washers, Steel, Plain (Flat), Unhardened for General Use
- F3125/F3125M-19e1Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120ksi (830MPa) and 150ksi (1040MPa) Minimum Tensile Strength, Inch and Meter Dimensions
- C. American Concrete Institute (ACI):
- 211.1-91(R2009)Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete
- 211.2-98(R2004)Standard Practice for Selecting Proportions for Structural Lightweight Concrete
- 318/318R-19Building Code Requirements for Structural Concrete and Commentary
- D. American Association of State Highway and Transportation Officials (AASHTO):
- AASHTO LRFD-2017.....LRFD Bridge Design Specifications, U.S., 8th Edition
- AASHTO M251-06Elastomeric Bearings
- E. American Welding Society (AWS):
- C5.4-93Recommended Practices for Stud Welding
- D1.1/D1.1M-20Structural Welding Code - Steel
- D1.4-18.....Structural Welding Code – Steel Reinforcing Bars

F. American National Standards Institute (ANSI):

A108/A118/A136-19Installation of Ceramic Tile

A137.1-19Ceramic Tile

G. Precast/Prestressed Concrete Institute (PCI):

Architectural Precast Concrete – Color and Texture Selection Guide

MNL-117-13Quality Control for Plants and Production of Architectural
Precast Concrete Products

MNL-120-17Design Handbook – Precast and Prestressed Concrete

MNL-122-07Architectural Precast Concrete

MNL-124-11Design for Fire Resistance of Precast Prestressed Concrete

MNL-127-99Erector’s Manual - Standards and Guidelines for the Erection
of Precast Concrete Products

MNL-135-00Tolerance Manual for Precast and Prestressed Concrete
Construction

TR-6-15-EGuidelines For The Use of Self-Consolidating Concrete In
Precast/Prestressed Concrete

H. Military Specifications (MIL. Spec):

MIL-C882E-89Cloth, Duck, Cotton or Cotton-Polyester Blend Synthetic
Rubber, Impregnated, and Laminated, Oil Resistant

I. Department of Veterans Affairs:

Physical Security Design Manual for VA] Life Safety Protected Facilities-January 2015

PART 2 - PRODUCTS

2.1 MOLD MATERIALS

- A. Molds: Rigid, dimensionally stable, nonabsorptive material, warp and buckle free, that will provide continuous and true precast concrete surfaces within fabrication tolerances indicated; non-reactive with concrete and suitable for producing required finishes:
1. Mold-Release Agent: Commercially produced form-release agent that will not bond with, stain or adversely affect precast concrete surfaces and will not impair subsequent surface or joint treatments of precast concrete.

2.2 REINFORCING MATERIALS

- A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (Grade 420), deformed.
- B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 30 percent.
- C. Weldable Reinforcing Bars: ASTM A706/A706M, deformed.
 - 1. Galvanized Reinforcing Bars: ASTM A767/A767M, Class II zinc coated, hot-dip galvanized and chromate wash treated after fabrication and bending.
 - 2. Epoxy-Coated Reinforcing Bars: ASTM A775/A775M or ASTM A934/A934M.
 - 3. Steel Bar Mats: ASTM A184/A184M, assembled with clips.
 - a. Plain-Steel Welded Wire Reinforcement: ASTM A1064/A1064M, fabricated from galvanized and chromate wash treated steel wire into flat sheets.
 - b. Deformed-Steel Welded Wire Reinforcement: ASTM A1064/A1064M, flat sheet.
- D. Epoxy-Coated-Steel Welded Wire Reinforcement: ASTM A884/A884M Class A coated, plain on flat sheet, Type 1 bendable coating.
- E. Prestressing Strand: ASTM A416/A416M, Grade 270 (Grade 1860), uncoated, 7-wire, low-relaxation strand.
- F. Supports: Suspend reinforcement from back of mold or use bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place according to PCI MNL 117.

2.3 CONCRETE MATERIALS

- A. Portland Cement: ASTM C150/C150M, Type I or III.
 - 1. For surfaces exposed to view in finished structure, use gray same type, brand, and mill source throughout the precast concrete production.
 - 2. Standard gray Portland cement may be used for non-exposed backup concrete.
- B. Supplementary Cementitious Materials for unexposed surfaces (backup concrete) only.
 - 1. Fly Ash Admixture: ASTM C618, Class C or F with maximum loss on ignition of 3 percent.
 - 2. Metakaolin Admixture: ASTM C618, Class N.
 - 3. Silica Fume Admixture: ASTM C1240 with optional chemical and physical requirement.
 - 4. Ground Granulated Blast-Furnace Slag: ASTM C989/C989M, Grade 100 or 120.

- C. Normal-Weight Aggregates: Except as modified by PCI MNL 117, ASTM C33/C33M, with coarse aggregates complying with Class 5S. Provide and stockpile fine and coarse aggregates for each type of exposed finish from a single source (pit or quarry) for entire project.
 - 1. Face-Mix Coarse Aggregates: Selected, hard, and durable; free of material that reacts with cement or causes staining; to match selected finish sample.
 - a. Gradation: Uniformly graded
- D. Unexposed Surface (Backup) Concrete Aggregates: ASTM C33/C33M or ASTM C330/C330M.
- E. Admixtures: Admixtures containing calcium chloride, or more than 0.15 percent chloride ions or other salts by weight of admixture are not permitted.
 - 1. Coloring Admixture: ASTM C979/C979M, synthetic or natural mineral-oxide pigments or colored water-reducing admixtures, temperature stable and non-fading.
 - 2. Air Entraining Admixture: ASTM C260, certified by manufacturer to be compatible with other required admixtures.
 - 3. Water-Reducing Admixture: ASTM C494/C494M, Type A.
 - 4. Retarding Admixture: ASTM C494/C494M, Type B.
 - 5. Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type D.
 - 6. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
 - 7. High-Range, Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type G.
 - 8. Plasticizing Admixture for Flowable Concrete: ASTM C1017/C1017M.
- F. Water: Potable; free from deleterious material that may affect color stability, setting, or strength of concrete and complying with chemical limits of PCI MNL 117.

2.4 STEEL CONNECTION MATERIALS

- A. Carbon-Steel Shapes and Plates: ASTM A36/A36M except silicon (Si) content in the range of 0 to 0.03percent or 0.15 to 0.25 percent for materials to be galvanized. Steel with chemistry conforming to the formula $Si + 2.5P \leq 0.09$ is also acceptable.

- B. Carbon-Steel Headed Studs: ASTM A108, Grades 1018 through 1020, cold finished and bearing the minimum mechanical properties for studs as indicated under PCI MNL 117, Table 3.2.3.
 - 1. Make welds in accordance with AWS D1.1/D1.1M, Type A or B, with arc shields.
- C. Carbon-Steel Plate: ASTM A283/A283M.
- D. Malleable Iron Castings: ASTM A47/A47M. Grade 32510.
- E. Carbon-Steel Castings: ASTM A27/A27M, Grade U-60-30 (Grade 415-205).
- F. High-Strength, Low-Alloy Structural Steel: ASTM A572/A572M except silicon (Si) content in the range of 0 to 0.03 or 0.15 to 0.25 percent for materials to be galvanized. Steel with chemistry conforming to the formula $Si + 2.5P \leq 0.09$ is also acceptable.
- G. Carbon-Steel Structural Tubing: ASTM A500/A500M, Grade B.
- H. Wrought Carbon-Steel Bars: ASTM A675/A675M, Grade 65 (Grade 450).
- I. Deformed-Steel Wire or Bar Anchors: ASTM A1064/A1064M or ASTM A706/A706M.
- J. Carbon-Steel Bolts and Studs: ASTM A307, Grade A, carbon-steel, hex-head bolts and studs; carbon-steel nuts ASTM A563M (A563), Grade A; and flat, unhardened steel washers complying with ASTM F844.
- K. High-Strength Bolts and Nuts: ASTM F3125/F3125M), Type 1, heavy hex steel structural bolts, heavy hex carbon-steel nuts, complying with ASTM A563M (A563) and hardened carbon-steel washers complying with ASTM F436M (F436).
- L. Finish: For exterior steel items and items indicated for galvanizing, apply zinc coating by hot-dip process according to ASTM A123/A123M, after fabrication, or ASTM A153/A153M, as applicable
 - 1. Galvanizing Repair Paint: High-zinc-dust-content paint with minimum 2 mils (0.002 inch) dry film containing not less than 94 percent zinc dust by weight, and complying with SSPC-Paint 20.
- M. Welding Electrodes: Provide materials that comply with requirements of AWS D1.1/D1.1M. Submit product data on welding electrodes and rods.

2.5 STAINLESS-STEEL CONNECTION MATERIALS

- A. Stainless-Steel Plate: ASTM A666, Type 304, of grade suitable for application.

- B. Stainless-Steel Bolts and Studs: ASTM F593, alloy 304 or 316, hex-head bolts and studs; stainless-steel nuts; and flat, stainless steel washers. Lubricate threaded parts of stainless steel bolts with an anti-seize thread lubricant during assembly.
- C. Stainless-Steel Headed Studs: ASTM A276 and bearing the minimum mechanical properties for studs as indicated under PCI MNL 117, Table 3.2.3.

2.6 BEARING PADS AND OTHER ACCESSORIES

- A. Provide bearing pads for units as follows:
 - 1. Elastomeric Pads: AASHTO M251, plain, vulcanized, 100 percent polychloroprene (neoprene) elastomer, molded to size or cut from a molded sheet, 50 to 70 Shore A durometer according to ASTM D2240, minimum tensile strength 15.5 MPa (2250 psi) per ASTM D412.
 - 2. Random-Oriented, Fiber-Reinforced Elastomeric Pads: Preformed, randomly oriented synthetic fibers set in elastomer. Surface hardness of 70 to 90 Shore A durometer according to ASTM D2240. Capable of supporting a compressive stress of 20.7 MPa (3000 psi) with no cracking, splitting or delaminating in the internal portions of the pad. Test one specimen for each 200 pads used in the project. Submit test results.
 - 3. Cotton-Duck-Fabric-Reinforced Elastomeric Pads: Preformed, horizontally layered cotton-duck fabric bonded to an elastomer. Surface hardness of 80 to 100 Shore A durometer according to ASTM D2240. Conforming to Division II, Section 18.10.2 of AASHTO LRFD, or MIL-C-882E.
 - 4. Frictionless Pads: Tetrafluoroethylene (teflon), glass-fiber reinforced, bonded to stainless or mild-steel plates, of type required for in-service stress.
 - 5. High-Density Plastic: Multimonomer, nonleaching, plastic strip.
- B. Reglets: Stainless steel, ASTM A240/A240M, Type 302 felt or fiber filled or cover face opening of slots.
- C. Vents and Weeps: Polyvinyl chloride plastic tubing, 9.5 mm (3/8 inch) inside diameter.
- D. Provide sealant backings and sealant into stone-to-stone joints and stone-to-concrete joints in accordance with Section 07 92 00, JOINT SEALANTS.

- E. Accessories: Provide clips, hangers, plastic or steel shims, and other accessories required to install units.

2.7 GROUT MATERIALS

- A. Sand-Cement Grout: Portland Cement, ASTM C150/C150M, Type I, and clean, natural sand, ASTM C144, or ASTM C404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.
- B. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C1107/C1107M, Grade A for drypack and Grades B and C for flowable grout and of a consistency suitable for application within a 30-minute working time.
- C. Epoxy-resin grout: Two-component mineral-filled epoxy-resin: ASTM C881 of type, grade, and class to suit requirements.

2.8 CONCRETE MIXES

- A. Prepare design mixes to match COR's sample for each type of concrete required.
 - 1. Limit use of fly ash and granulated blast-furnace slag to 20 percent replacement of Portland cement by weight; metakaolin and silica fume to 10 percent of Portland cement by weight.
- B. Provide design mixes prepared by a qualified independent testing agency or by qualified precast plant personnel at fabricator's option.
- C. Limit water-soluble chloride ions to the maximum percentage by weight of cement permitted by ACI 318/318M or PCI MNL 117 when tested in accordance with ASTM C1218/C1218M.
- D. Normal Weight Concrete Face and Backup Mixtures: Proportion mixes by either laboratory trial batch or field test data methods according to ACI 211.1, with materials to be used on Project, to provide normal-weight concrete with the following properties:
 - 1. Compressive Strength (28 Days): 34.5 MPa (5000 psi).
 - 2. Maximum Water-Cementitious Materials Ratio: 0.45.
 - 3. Release strength as required by design.

- E. Water Absorption: 6 percent by weight or 14 percent by volume, tested according to PCI MNL 117.
- F. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having air content as follows.
- G. Total air content for various sizes of coarse aggregate for normal weight concrete.

Total Air Content, Percent, by Volume		
Nominal Maximum Size of Aggregate mm (inch)	Severe Exposure	Moderate Exposure
Less than 9 (3/8)	9	7
9 (3/8)	7-1/2	6
13 (1/2)	7	5-1/2
19 (3/4)	6	5
25 (1)	6	5
38 (1-1/2)	5-1/2	4-1/2

- H. When included in design mixes, add other admixtures to concrete mixes according to manufacturer's written instructions.

PART 3 - EXECUTION

3.1 MOLD FABRICATION

- A. Molds: Construct and maintain molds, mortar tight, within fabrication tolerances and of sufficient strength to withstand pressures due to concrete-placement, vibration operations, and temperature changes and for prestressing and detensioning operations.
 - 1. Form joints are not acceptable on faces exposed to view in the finished work.
 - 2. Edge and Corner Treatment: Uniformly chamfered

3.2 THIN BRICK FACINGS

- A. Place form liner templates accurately to provide grid for brick facings. Provide solid backing and supports to maintain stability of liners while placing bricks and during concrete placement.
- B. Match appearance of sample panel(s).

- C. Securely place brick units face down into form liner pockets and place concrete backing mixture.
- D. After stripping units, clean faces and joints of brick facing.

3.3 STONE VENEER FACINGS

- A. Position stone facings to comply with requirements and in locations indicated on shop drawings. Install anchors, supports, and other attachments indicated or necessary to secure stone in place. Maintain projection requirements of stone anchors into concrete substrate. Orient stone veining in direction indicated on shop drawings. Keep reinforcement a minimum of 19 mm (3/4 inch) from the back surface of stone. Provide continuous spacers to obtain uniform joints of widths indicated and with edges and faces aligned according to established relationships and indicated tolerances. Ensure no passage of precast concrete matrix to stone surface.
- B. Apply a continuous sealant bead along both sides and top of precast concrete panels at the stone/precast concrete interface using the bond breaker as a joint filler backer. Do not seal panel bottom edge.
 - 1. Fill anchor holes with low modulus polyurethane sealant filler and install anchors.
 - 2. Fill anchor holes with epoxy filler and install anchors with minimum 13 mm (1/2 inch) long, 60 durometer elastomeric sleeve at the back surface of the stone.
 - 3. Install 0.15 to 0.25 mm (6 to 10 mil) thick polyethylene sheet to prevent bond between back of stone facing and concrete substrate.
 - 4. Install 3 mm (1/8 inch) thick polyethylene-foam bond breaker to prevent bond between back of stone facing and concrete substrate.
- C. Stone Anchor Shear and Tensile Testing: Engage accredited testing laboratory acceptable to the COR to evaluate and test the proposed stone anchorage system. Test for shear and tensile strength of proposed stone anchorage system in accordance with ASTM E488/E488M or ASTM C1354/C1354M modified as follows:
 - 1. Prior to testing, submit for approval a description of the test assembly (including pertinent data on materials), test apparatus, and procedures.

2. Test 305 by 305 mm (12 by 12 inches) samples of stone affixed to testing apparatus through proposed anchorages. Provide two (2) sets of six (6) stone samples each. One (1) set for shear load testing and the other set for tensile load testing.
3. Test stone anchors of the sizes and shapes proposed for the installation.
 - a. Test the assembly to failure and record the test load at failure. Record the type of failure, anchor pullout or stone breakage, and any other pertinent information, in accordance with the requirements of ASTM E488/E488M.
- D. Stone to Precast Concrete Anchorages: Provide anchors in numbers, types and locations required to satisfy specified performance criteria, but not less than two (2) anchors per stone unit of less than 0.19 sq. m (2 sq. feet) in area and four (4) anchors per unit of less than 1.1 sq. m (12 sq. feet) in area; and for units larger than 1.1 sq. m (12 sq. feet) in area, provide anchors spaced not more than 610 mm (24 inches) on center both horizontally and vertically. Locate anchors a minimum 152 mm (6 inches) from stone edge.

3.4 FABRICATION

- A. Cast-in Anchors, Inserts, Plates, Angles, and Other Anchorage Hardware: Fabricate anchorage hardware with sufficient anchorage and embedment to comply with design requirements. Position anchors for attachment of loose hardware and secure in place during precasting operations. Locate anchorage hardware where it does not affect position of main reinforcement or concrete placement.
 1. Weld headed studs and deformed bar anchors used for anchorage according to AWS D1.1/D1.1M and AWS C5.4.
- B. Furnish loose hardware items including steel plates, clip angles, seat angles, anchors, dowels, cramps, hangers, and other hardware shapes for securing units to supporting and adjacent construction.
- C. Provide cast-in reglets, slots, holes, and other accessories in units as indicated on contract documents.
- D. Provide cast-in openings larger than 254 mm (10 inches) in any dimension. Do not drill or cut openings or reinforcing without approval of COR.

- E. Reinforcement: Comply with recommendations in PCI MNL 117 for fabrication, placing, and supporting reinforcement.
1. Place reinforcing steel and prestressing strand to maintain at least 19 mm (3/4 inch) minimum concrete cover. Increase cover requirements for reinforcing steel to 38 mm (1-1/2 inches) when units are exposed to corrosive environment or severe exposure conditions. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete.
 2. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one (1) full mesh spacing and wire tie laps, where required by design. Offset laps of adjoining widths to prevent continuous laps in either direction.
 3. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy the bond with concrete. When damage to epoxy-coated reinforcing exceeds limits specified in ASTM A775/A775M, repair with patching material compatible with coating material and epoxy coat bar ends after cutting.
 4. Accurately position, support, and secure reinforcement against displacement during concrete- placement and consolidation operations. Completely conceal support devices to prevent exposure on finished surfaces.
- F. Prestress tendons for units by pretensioning methods. Comply with PCI MNL 117.
1. Protect strand ends and anchorages with bituminous paint to prevent corrosion and rust spots.
 2. Delay detensioning or post-tensioning of precast, prestressed architectural precast concrete units until concrete has reached its indicated minimum design release compressive strength as established by test cylinders cured under the same conditions as concrete member.
 3. Detension pretensioned tendons either by gradually releasing tensioning jacks or by heat-cutting tendons, using a sequence and pattern to prevent shock or unbalanced loading.
 4. If concrete has been heat cured, detension while concrete is still warm and moist.

- G. Mix concrete according to PCI MNL 117 and requirements in PART 2. After concrete batching, no additional water may be added.
 - 1. At the fabricator's option either of the following mix design/casting techniques may be used:
 - a. A single design mix throughout the entire thickness of panel.
 - b. Design mixes for facing and backup; using cement and aggregates for each type as indicated, for consecutive placement in the mold. Use cement and aggregate specified for facing mix, use cement and aggregate for backup mix complying with criteria specified as selected by the fabricator.
- H. Place concrete in a continuous operation. Comply with requirements in PCI MNL 117.
 - 1. Place backup concrete to ensure bond with face mix concrete.
 - 2. Place self-consolidating concrete without vibration in accordance with PCI TR-6.
- I. Identify pickup points of units and orientation in structure with permanent markings, complying with markings indicated on shop drawings. Imprint or permanently mark casting date on each unit on a surface that will not show in finished structure.
- J. Cure concrete, according to requirements in PCI MNL 117, by moisture retention without heat.
- K. Repair damaged units to meet acceptability requirements of PCI MNL 117 and the COR.
- L. Reinforce architectural precast concrete units to resist handling, transportation and erection stresses, and specified in-place loads, whichever governs.
- M. Comply with requirements in PCI MNL 117 and requirements in this section for measuring, mixing, transporting, and placing concrete. After concrete batching, no additional water may be added.
- N. Place face mixture to a minimum thickness after consolidation of the greater of 25 mm (1 inch) or 1.5 times the nominal maximum aggregate size, but not less than the minimum reinforcing cover of 19 mm (3/4 inch).
 - 1. Use a single design mixture for those units in which more than one major face (edge) is exposed.

2. Where only one (1) face of unit is exposed, at the fabricator's option, either of the following mixture design/casting techniques may be used:
 - a. A single design mix throughout the entire thickness of panel.
 - b. Separate mixtures for face and backup concrete; using cement and aggregates for each type as appropriate, for consecutive placement in the mold. Use cement and aggregate specified for face mixture. Use cement and aggregate for backup mixture complying with specified criteria or as selected by the fabricator.
- O. Thoroughly consolidate placed concrete by internal or external vibration without dislocating or damaging reinforcement and built-in items, and minimize pour lines, honeycombing, or entrapped air voids on surfaces. Use equipment and procedures complying with PCI MNL 117.
 1. Place self-consolidating concrete without vibration in accordance with PCI TR-6.
- P. Comply with PCI MNL 117 procedures for hot- and cold-weather concrete placement.

3.5 INSULATED PANEL CASTING

- A. Cast and screed supported wythe over mold.
- B. Place insulation boards, abutting edges and ends of adjacent boards. Insert wythe connectors through insulation, and consolidate concrete around connectors according to connector manufacturer's written instructions.
- C. Cast and screed top wythe to meet required finish.

3.6 FABRICATION TOLERANCES

- A. Fabricate units straight and true to size and shape with exposed edges and corners precise and true so each finished unit complies with PCI MNL 117 product tolerances as well as position tolerances for cast-in items.
- B. Fabricate architectural trim units such as sills, lintels, coping, cornices, quoins, medallions, bollards, benches, planters, and pavers, with tolerances meeting PCI MNL 135.
- C. Brick-Faced Architectural Precast Concrete Units.
 1. Alignment of mortar joints:
 - a. Jog in Alignment: 3 mm (1/8 inch).
 - b. Alignment with Panel Centerline: Plus or Minus 3 mm (1/8 inch).

2. Variation in Width of Exposed Mortar Joints: Plus or Minus 6 mm (1/4 inch).
 3. Tipping of Individual Bricks from the Panel Plane of Exposed Brick Surface: Plus 1.5 mm (1/16 inch); Minus 6 mm (1/4 inch) \leq depth of form liner joint.
 4. Exposed Brick Surface Parallel to Primary Control Surface of Panel: Plus 6 mm (1/4 inch); Minus 3 mm (1/8 inch).
 5. Individual Brick Step in Face from Panel Plane of Exposed Brick Surface: Plus 1.5 mm (1/16 inch); Minus 6 mm (1/4 inch) \leq depth of form liner joint.
- D. Stone Veneer-Faced Architectural Precast Concrete Units:
1. Variation in Cross-Sectional Dimensions: For thickness of walls from dimensions indicated: Plus or minus 6 mm (1/4 inch).
 2. Variation in Joint Width: 3 mm in 914 mm (1/8 inch in 36 inches) or a quarter of nominal joint width, whichever is less.
 3. Variation in Plane between Adjacent Stone Units (Lipping): 1.6 mm (1/16 inch) difference between planes of adjacent units.

3.7 FINISHES

- A. Provide exposed panel faces free of joint marks, grain, and other obvious defects. Corners, including false joints to be uniform, straight and sharp. Finish exposed-face surfaces of units to match approved design reference sample and as follows:
1. PCI's "Architectural Precast Concrete –Color and Texture Selection Guide," of plate numbers indicated.
 2. As-Cast Surface Finish: Provide surfaces free of excessive air voids, sand streaks, and honeycombs.
 3. Textured-Surface Finish: Impart by form liners to provide surfaces free of air voids, sand streaks, and honeycombs, with uniform color and texture.
 4. Bushhammer Finish: Use power and hand tools to remove matrix and fracture coarse aggregates.
 5. Exposed Aggregate Finish: Use chemical retarding agents applied to concrete forms and washing and brushing procedures to expose aggregate and surrounding matrix surfaces after form removal.

6. Abrasive-Blast Finish: Use abrasive grit, equipment, application techniques, and cleaning procedures to expose aggregate and surrounding matrix surfaces.
 7. Acid-Etched Finish: Use acid and hot-water solution, equipment, application techniques, and cleaning procedures to expose aggregate and surrounding matrix surfaces. Protect hardware, connections and insulation from acid attack.
 8. Honed Finish: Use continuous mechanical abrasion with fine grit, followed by filling and rubbing procedures.
 9. Polished Finish: Use continuous mechanical abrasion with fine grit, followed by filling and rubbing procedures.
 10. Sand-Embedment Finish: Use selected stones placed in a sand bed in bottom of mold, with sand removed after curing.
- B. Finish exposed top, bottom, and back surfaces of units to match face-surface finish.
- C. Finish unexposed surfaces top, bottom, and back of units by smooth steel-trowel finish.
- D. Finish unexposed surfaces of units by float finish.

3.8 ERECTION PREPARATION

- A. Deliver anchorage devices that are embedded in or attached to the building structural frame or foundation before start of such work. Furnish locations, setting diagrams, and templates for the proper installation of each anchorage device.
- B. Examine supporting structural frame or foundation and conditions for compliance with requirements for installation tolerances, true and level bearing surfaces, and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Do not install units until supporting cast-in-place concrete building structural framing has attained minimum allowable design strength.

3.9 ERECTION

- A. Erect units level, plumb and square within the specified allowable tolerances. Provide temporary supports and bracing as required to maintain position, stability, and alignment of units until permanent connections are completed.

1. Install temporary steel or plastic spacing shims or bearing pads as precast concrete units are being erected. Tack weld steel shims to each other to prevent shims from separating.
 2. Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.
 3. Remove projecting lifting devices and use sand-cement grout to fill voids within recessed lifting devices flush with surface of adjacent precast concrete surfaces when recess is exposed.
 4. Unless otherwise shown provide for uniform joint widths of 19 mm (3/4 inch).
- B. Connect units in position by bolting, welding, grouting, or as otherwise indicated on approved Erection Drawings. Remove temporary shims, wedges, and spacers as soon as practical after connecting or grouting are completed.
1. Disruption of roof flashing continuity by connections is not permitted; concealment within roof insulation is acceptable.
 2. Welding: Comply with and AWS D1.1/D1.1M and AWS D1.4/1.4M requirements for welding, welding electrodes, appearance of welds, and methods used in connecting welding work.
 - a. Protect units and bearing pads from damage by field welding or cutting operations and provide noncombustible shields as required.
 - b. When welds are not specified, provide continuous fillet welds, using not less than the minimum fillet as specified by AWS.
 - c. Clean weld affected metal surfaces and apply a minimum 2 mils (0.002 inch) dry thickness coat of galvanized repair paint to galvanized surfaces in conformance with ASTM A780/A780M.
 - d. Visually inspect welds critical to precast connections. Visually check welds for completion and remove, reweld or repair defective welds.
 3. At bolted connections, provide lock washers, tack welding, or other acceptable means to prevent loosening of nuts after final adjustment.

- a. Where slotted connections are used, verify bolt position and tightness. For sliding connections, properly secure bolt but allow bolt to move within connection slot. For friction connection apply specified bolt torque and check 25 percent of bolts at random by calibrated torque wrench.
4. Grouting Connections: Grout connections where required or indicated on shop (erection drawings). Retain flowable grout in place until strong enough to support itself. Pack spaces with stiff grout material, tamping until voids are completely filled. Place grout and finish smooth, level, and plumb with adjacent concrete surfaces. Promptly remove grout material from exposed surfaces before it affects finishes or hardens.
- C. Attachments: Upon approval of COR, precast pre-stressed products may be drilled or "shot" for fasteners or small openings, provided reinforcing or pre-stressing steel is not damaged or cut.
 1. Should spalling occur, repair according to this specification section.
- D. Venting and Weeps: Where precast concrete panels form the outer wythe of cavity wall construction, vent the cavity wall.
 1. Use polyvinyl chloride plastic tubing to vent the cavity.
 2. Place plastic vent tubes "tilted down and out" in horizontal and vertical joints.
 3. Space vent tubes in accordance with shop drawings, but not less than two vents per panel or approximately 1219 mm (4 feet) on centers.
- E. Setting: Where shown, fill joints with cement mortar specified in Section 04 05 13,
MASONRY MORTARING
 1. Clean surfaces forming beds and other joints for precast concrete panels of dust, dirt, and other foreign matter, and wet thoroughly to prevent suction before precast concrete, elements are set.
 2. Set precast element level and true to line with uniform joints filled completely with mortar.
 3. Rake out joints 25 mm (1-inch) deep for pointing or sealants.
 4. Joints required to have only sealant to be kept free of mortar for full depth.
 5. Keep exposed faces of precast concrete elements free of mortar.

6. Remove wedges, spacers, or other appliances which are likely to cause staining from joints.
 7. Where parging is shown, parge back of elements solid with mortar. Apply parging without skips or holidays.
- F. Pointing: Wash and brush clean, leaving joints free from loose mortar, dust and other foreign material.
1. Carefully point with a slightly concave joint.
 2. Mortar for pointing as specified in Section 04 05 13, MASONRY MORTARING. Provide same material and color sand used in fabrication of precast concrete elements.
- G. Sealing of Joints: Where shown and where required to make work watertight: clean, dry and seal joints between precast concrete elements and between precast elements and adjoining materials as specified in Section 07 92 00, JOINT SEALANTS.

3.10 ERECTION TOLERANCES

- A. Erect units level, plumb, square, true, and in alignment without exceeding the erection tolerances of PCI MNL 117, Appendix I

3.11 FIELD QUALITY CONTROL

- A. Special Inspections: Contractor engaged qualified special inspector approved by COR is to perform the following special inspections and prepare reports:
1. Erection of loadbearing precast concrete members.
- B. Testing Agency: Contractor engaged qualified testing agency approved by COR is to perform tests and inspections and prepare test reports.
- C. Visually inspect field welds and test according to ASTM E165 or to ASTM E709.
- D. Report test results directly from testing agency within days after testing and in writing to Contractor and COR.
- E. As directed by COR, repair, or remove and replace work that does not comply with specified requirements.
- F. Perform additional testing and inspecting, at no additional cost, to determine compliance of corrected work with specified requirements.

3.12 REPAIRS

- A. When permitted by COR, repair damaged units.
- B. Mix patching materials and repair units so cured patches blend with color, texture, and uniformity of adjacent exposed surfaces and show no apparent line of demarcation between original and repaired work, when viewed in typical daylight illumination from a distance of 6.1 m (20 feet).
- C. Prepare and repair damaged galvanized coatings with galvanizing repair paint according to ASTM A780/A780M.
- D. Remove and replace damaged units when repairs do not meet requirements.
- E. Repair damaged units to meet acceptability of PCI MNL 117.
- F. Wire brush, clean, and paint damaged prime painted components with the same type of shop primer.

3.13 CLEANING:

- A. Clean surfaces of precast concrete to be exposed to view, as necessary, prior to shipping.
- B. Clean mortar, plaster, fireproofing, weld slag, and any other deleterious material from concrete surfaces and adjacent materials immediately.
- C. Clean exposed surfaces of precast concrete units after erection and completion of joint treatment to remove weld marks, other markings, dirt, and stains.
 - 1. Perform cleaning procedures, if necessary, according to precast concrete fabricator's recommendations. Clean soiled precast concrete surfaces with detergent and water, using stiff fiber brushes and sponges, and rinse with clean water. Protect other work from staining or damage due to cleaning operations.
 - 2. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes or damage adjacent materials.

--- E N D ---

**SECTION 04 05 13
MASONRY MORTARING**

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Masonry mortar installed by other masonry sections.

1.2 RELATED REQUIREMENTS

- A. Mortar used in Section:
 - 1. Section 03 45 00, PRECAST ARCHITECTURAL CONCRETE.
 - 2. Section 04 01 00, MAINTENANCE OF MASONRY.
 - 3. Section 04 05 16, MASONRY GROUTING.
 - 4. Section 04 20 00, UNIT MASONRY.
 - 5. Section 04 72 00, CAST STONE MASONRY.
- B. Mortar Color: Section 09 06 00, SCHEDULE FOR FINISHES.

1.3 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. ASTM International (ASTM):
 - 1. C40/C40M-11 - Organic Impurities in Fine Aggregates for Concrete.
 - 2. C91/C91M-12 - Masonry Cement.
 - 3. C144-11 -Aggregate for Masonry Mortar.
 - 4. C150/C150M-15 - Portland Cement.
 - 5. C207-06(2011) - Hydrated Lime for Masonry Purposes.
 - 6. C270-14a - Mortar of Unit Masonry.
 - 7. C595/C595M-15e1 - Blended Hydraulic Cements.
 - 8. C780-15 - Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
 - 9. C979/C979M-10 - Pigments for Integrally Colored Concrete.
 - 10. C1329/C1329M-15 - Mortar Cement.

1.4 SUBMITTALS

- A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data:
 - 1. Description of each product.
- C. Test Reports: Certify each product complies with specifications.
 - 1. Mortar.
 - 2. Admixtures.
- D. Certificates: Certify each product complies with specifications.
 - 1. Portland cement.
 - 2. Masonry cement.
 - 3. Mortar cement.
 - 4. Hydrated lime.
 - 5. Fine aggregate.
 - 6. Color admixture.
- E. Qualifications: Substantiate qualifications comply with specifications.
 - 1. Testing laboratory.

1.5 QUALITY ASSURANCE

- A. Preconstruction Testing:
 - 1. Engage independent testing laboratory to tests and submit reports.
 - a. Deliver samples to laboratory in number and quantity required for testing.
 - 2. Test mortar and materials specified.
 - 3. Mortar:
 - a. Test for compressive strength and water retention according to ASTM C270.
 - b. Minimum Mortar compressive strengths 28 days:
 - 1) Type M: 17.2 MPa (2,500 psi).
 - 2) Type S: 12.4 MPa (1,800 psi).
 - 3) Type N: 5.1 MPa (750 psi).
 - 4. Non Staining Cement: Test for water soluble alkali.

- a. Water Soluble Alkali: Maximum 0.03 percent.
- 5. Sand: Test for deleterious substances, organic impurities, soundness and grading.

1.6 DELIVERY

- A. Deliver products in manufacturer's original sealed packaging.
- B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, color, production run number, and manufacture date.
- C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.7 STORAGE AND HANDLING

- A. Store masonry materials under waterproof covers on planking clear of ground.
 - 1. Protect loose, bulk materials from contamination.
- B. Protect products from damage during handling and construction operations.

1.8 WARRANTY

- A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Hydrated Lime: ASTM C207, Type S.
- B. Aggregate for Masonry Mortar: ASTM C144 and as follows:
 - 1. Light colored sand for mortar for laying face brick.
 - 2. White plastering sand meeting sieve analysis for mortar joints for pointing and laying of structural facing tile units except that 100 percent passes No. 8 sieve, and maximum 5 percent retained on No. 16 sieve.
 - 3. Test sand for color value according to ASTM C40/C40M. Sand producing color darker than specified standard is unacceptable.
- C. Blended Hydraulic Cement: ASTM C595/C595M, Type IS, IP.
- D. Masonry Cement: ASTM C91/C91M. Type N, S, Or M.
 - 1. Use white masonry cement whenever white mortar is specified.

- E. Mortar Cement: ASTM C1329/C1329M, Type N, S or M.
- F. Portland Cement: ASTM C150/C150M, Type I.
 - 1. Use white Portland cement wherever white mortar is specified.
- G. Pigments: ASTM C979/C979M; inorganic, inert, mineral pigments only, unaffected by atmospheric conditions, nonfading, alkali resistant, and water insoluble.
- H. Water: Potable, free of substances that are detrimental to mortar, masonry, and metal.

2.2 PRODUCTS - GENERAL

- A. Basis of Design: Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Provide each product from one manufacturer

2.3 MIXES

- A. Pointing Mortar for New Work:
 - 1. For Cast Stone or Precast Concrete: Proportion by volume; one part white Portland cement, two parts white sand, and 1/5 part hydrated lime.
 - 2. Pointing Mortar for Glazed Structural Facing Tile:
 - a. Proportion by volume: One part white Portland cement, two parts of graded white sand passing Number 50 sieve, and 1/8 part hydrated lime.
- B. Tuck Pointing Mortar for Repair Work: Tuck pointing mortar specified in Section 04 01 00, MAINTENANCE OF MASONRY.
- C. Masonry Mortar: ASTM C270.
 - 1. Admixtures:
 - a. Do not use mortar admixtures, and color admixtures unless approved by Contracting Officer's Representative.
 - b. Do not use antifreeze compounds.
- D. Colored Mortar:
 - 1. Maintain uniform mortar color for exposed work, throughout.
 - 2. Match mortar color in approved sample or sample panel specified in Section 04 20 00, UNIT MASONRY.

3. Alteration Work Mortar Color: Match existing mortar unless specified otherwise in Section 09 06 00, SCHEDULE FOR FINISHES.

E. Color Admixtures:

1. Proportion as specified by manufacturer.
2. For color, see Section 09 06 00, SCHEDULE FOR FINISHES.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine and verify substrate suitability for product installation.
- B. Protect existing construction and completed work from damage.

3.2 MIXING

- A. Measure ingredients by volume using known capacity container.
- B. Mix for 3 to 5 minutes in a mechanically operated mortar mixer.
- C. Mix water with dry ingredients in sufficient amount to provide a workable mixture which will adhere to vertical surfaces of masonry units.
- D. Mortar Stiffened Because of Water Loss Through Evaporation:
 1. Re-temper by adding water to restore to proper consistency and workability.
 2. Discard mortar reaching initial set or unused within two hours of mixing.
- E. Pointing Mortar:
 1. Mix dry ingredients with enough water to produce damp mixture of workable consistency retaining shape when formed into ball.
 2. Allow mortar to stand in dampened condition for 60 to 90 minutes.
 3. Add water to bring mortar to a workable consistency before use.

3.3 MORTARING

- A. Type M Mortar: Use for precast concrete panels, and parging below grade.
- B. Type S Mortar: Use for masonry containing vertical reinforcing bars (non-engineered) and engineered reinforced unit masonry work.
- C. Brick Veneer Over Frame Back Up Walls: Use Type S Portland cement-lime mortar.
- D. Type N Mortar: Use for other masonry work.

- E. Type N Mortar: Use for pointing items and tuck pointing specified.

3.4 FIELD QUALITY CONTROL

- A. Field Tests: Performed by testing laboratory specified in Section 01 45 29, TESTING LABORATORY SERVICES.
 - 1. Take and test samples during progress of work according to ASTM C780.

-- E N D --

SECTION 04 05 16
MASONRY GROUTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Grout for filling hollow concrete masonry cores.

1.2 RELATED REQUIREMENTS

- A. Grout used in Section:
 - 1. Section 04 20 00, UNIT MASONRY.
- B. Grout Color: Section 09 06 00, SCHEDULE FOR FINISHES.
- C. Ready-Mixed Grout: Section 09 30 13, CERAMIC/PORCELAIN TILING.
- D. Section 09 91 00, PAINTING.

1.3 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. American National Standards Institute (ANSI):
 - 1. A118.6-10 - Standard Cement Grouts for Tile Installation.
- C. ASTM International (ASTM):
 - 1. C40/C40M-11 - Organic Impurities in Fine Aggregates for Concrete.
 - 2. C150/C150M-15 - Portland Cement.
 - 3. C207-06(2011) - Hydrated Lime for Masonry Purposes.
 - 4. C404-11 - Aggregates for Masonry Grout.
 - 5. C476-11 - Grout for Masonry.
 - 6. C595/C595M-15e1 - Blended Hydraulic Cement.
 - 7. C979/C979M-10 - Pigments for Integrally Colored Concrete.
 - 8. C1019-14 - Sampling and Testing Grout.

1.4 SUBMITTALS

- A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

- B. Manufacturer's Literature and Data:
 - 1. Description of each product.
- C. Sustainable Construction Submittals:
 - 1. Recycled Content: Identify pre-consumer recycled content percentage by weight.
- D. Test Reports: Certify each product complies with specifications.
 - 1. Grout, each type.
 - 2. Cement.
 - 3. Aggregate.
- E. Certificates: Certify each product complies with specifications.
 - 1. Blended hydraulic cement.
 - 2. Portland cement.
 - 3. Grout.
 - 4. Hydrated lime.
 - 5. Aggregate.
 - 6. Color admixture.

1.5 QUALITY ASSURANCE

- A. Preconstruction Testing:
 - 1. Engage independent testing laboratory to perform tests and submit reports.
 - a. Deliver samples to laboratory in number and quantity required for testing.
 - 2. Grout:
 - a. Test compressive strength according to ASTM C1019 standard.
 - 3. Cement:
 - a. Test for water soluble alkali (nonstaining) when nonstaining cement is specified.
 - b. Nonstaining cement containing more than 0.03 percent water soluble alkali.
 - 4. Aggregate:
 - a. Test for deleterious substances, organic impurities, soundness and grading.

1.6 DELIVERY

- A. Deliver products in manufacturer's original sealed packaging.
- B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, production run number, and manufacture date.

1.7 STORAGE AND HANDLING

- A. Store masonry materials under waterproof covers on planking clear of ground, and protect damage from handling, dirt, stain, water and wind.
- B. Protect products from damage during handling and construction operations.

1.8 WARRANTY

- A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Grout Components:
 - 1. Hydrated Lime: ASTM C207, Type S.
 - 2. Aggregate For Masonry Grout: ASTM C404, Size 8.
 - 3. Blended Hydraulic Cement: ASTM C595, Type IS, IP.
 - 4. Portland Cement: ASTM C150, Type I.
 - 5. Water: Potable, free of substances that are detrimental to grout, masonry, and metal.

2.2 PRODUCTS - GENERAL

- A. Provide each product from one manufacturer
- B. Sustainable Construction Requirements:
 - 1. Blended Hydraulic Cement Recycled Content: Select products with recycled content to achieve overall Project recycled content requirement.
 - a. Fly Ash: 25 percent total recycled content, minimum.
 - b. Ground Granulated Blast-Furnace Slag: 50 percent total recycled content, minimum.

- c. Combined Fly Ash or Pozzolan and Ground Granulated Blast-Furnace Slag: 50 percent Portland cement minimum, with fly ash or pozzolan not exceeding 25 percent total recycled content, minimum.

2.3 MIXES

- A. Grout: ASTM C476; fine grout and coarse grout.
 - 1. Color Admixture:
 - a. Pigments: ASTM C979, inert, stable to atmospheric conditions, nonfading, alkali resistant, and water insoluble.
 - b. Use mineral pigments only. Organic pigments are not acceptable.
- B. Ready-Mixed Grout: ANSI A118.8.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine and verify substrate suitability for product installation.
- B. Protect existing construction and completed work from damage.
- C. Clean mortar from masonry cells protruding more than 1/2 inch to permit grout flow.
- D. Remove debris from grout spaces.
- E. Verify reinforcement is correctly placed before placing grout.

3.2 MIXING

- A. Mix grout in mechanically operated mixer.
 - 1. Mix grout for five minutes, minimum.
- B. Measure ingredients by volume using container of known capacity.
- C. Mix water with grout dry ingredients.
 - 1. Slump Range: 8 to 11 inches.

3.3 GROUTING

- A. Install grout according to Section 04 20 00, UNIT MASONRY.
- B. Use fine grout for filling wall cavities and hollow concrete masonry units where smallest cell dimension is 2 inches or less.

- C. Use either fine grout or coarse grout for filling wall cavities and hollow concrete masonry units where smallest cell dimension is greater than 2 inches.
- D. Use grout for filling bond beam or lintel units.

-- E N D --

**SECTION 042613
MASONRY VENEER**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Clay face brick.
 - 2. NOT USED.
 - 3. NOT USED.
 - 4. NOT USED.
 - 5. NOT USED.
 - 6. Mortar.
 - 7. Ties and anchors.
 - 8. Embedded flashing.
 - 9. Miscellaneous masonry accessories.
- B. Products Installed but not Furnished under This Section:
 - 1. Cast-stone trim in masonry veneer.
 - 2. Steel lintels in masonry veneer.
 - 3. Steel shelf angles for supporting masonry veneer.
- C. NOT USED:
 - 1. Section 033000 "Cast-in-Place Concrete".
 - 2. Section 051200 "Structural Steel Framing".

1.3 ALLOWANCES

- A. Face brick is part of the Face Brick Allowance.

1.4 DEFINITIONS

- A. CMU(s): Concrete masonry unit(s).

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. NOT USED:
- C. Shop Drawings: For the following:
 - 1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
 - 2. NOT USED.
 - 3. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.
- D. Samples for Initial Selection:
 - 1. Clay face brick in the form of straps of five or more bricks.
 - 2. NOT USED.
 - 3. NOT USED.
 - 4. NOT USED.
 - 5. NOT USED.
 - 6. Colored mortar.
 - 7. Weep holes/vents.
- E. Samples for Verification: For each type and color of the following:
 - 1. Clay face brick in the form of straps of five or more bricks.
 - 2. NOT USED.
 - 3. Special brick shapes.
 - 4. NOT USED.
 - 5. NOT USED.
 - 6. NOT USED.
 - 7. Make Samples using same sand and mortar ingredients to be used on Project.
 - 8. Weep holes and vents.
 - 9. Accessories embedded in masonry.

1.7 INFORMATIONAL SUBMITTALS

- A. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.
 - 1. Submittal is for information only. Receipt of list does not constitute approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.
- B. Material Certificates: For each type and size of the following:
 - 1. Masonry units.
 - a. Include data on material properties or material test reports substantiating compliance with requirements.
 - b. For brick, include size-variation data verifying that actual range of sizes falls within specified tolerances.
 - c. For exposed brick, include test report for efflorescence according to ASTM C 67.
 - d. For surface-coated brick, include test report for durability of surface appearance after 50 cycles of freezing and thawing according to ASTM C 67 or a list of addresses of buildings in Project's area where proposed brick has been used successfully and with a history of durability.
 - 2. Integral water repellant used in decorative CMUs.
 - 3. Cementitious materials. Include name of manufacturer, brand name, and type.
 - 4. Mortar admixtures.
 - 5. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
 - 6. Anchors, ties, and metal accessories.
- C. Mix Designs: For each type of mortar. Include description of type and proportions of ingredients.
 - 1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91/C 91M for air content.
- D. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.8 QUALITY ASSURANCE

- A. Sample Panels: Build sample panels to verify selections made under Sample submittals and to demonstrate aesthetic effects. Comply with requirements in Section 014000 "Quality Requirements" for mockups.
1. Build sample panels for **each type of exposed unit masonry construction** in sizes approximately **48 inches (1200 mm)** by **36 inches (900 mm)** high
 2. Build sample panels facing south.
 3. Where masonry is to match existing, build panels adjacent and parallel to existing surface.
 4. Clean one half of exposed faces of panels with masonry cleaner indicated.
 5. Protect approved sample panels from the elements with weather-resistant membrane.
 6. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Architect in writing.
 - a. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels unless such deviations are specifically approved by Architect in writing.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.10 FIELD CONDITIONS

- A. Protection of Masonry: During construction, cover tops of veneer, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 - 1. Extend cover a minimum of 24 inches down face of veneer, and hold cover securely in place.
- B. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry. Immediately remove grout, mortar, and soil that come in contact with masonry.
 - 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
 - 2. Protect sills, ledges, and projections from mortar droppings.
 - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 - 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- C. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.
 - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.
- D. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.
- B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

2.2 UNIT MASONRY, GENERAL

- A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6, except as modified by requirements in the Contract Documents.
- B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects will be exposed in the completed Work and will be within 20 feet vertically and horizontally of a walking surface.

2.3 BRICK

- A. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units:
 - 1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
 - 2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
 - 3. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
 - 4. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.
- B. Clay Face Brick: Facing brick complying with ASTM C 216.
 - 1. Basis of Design Product: Interstate Brick, Terra Cotta OR Approved alternate.
 - 2. Grade: SW.
 - 3. Type: FBX.
 - 4. Initial Rate of Absorption: Less than 30 g/30 sq. in. per minute when tested according to ASTM C 67.
 - 5. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
 - 6. Surface Coating: Brick with colors or textures produced by application of coatings shall withstand 50 cycles of freezing and thawing according to ASTM C 67 with no observable difference in the applied finish when viewed from 10 feet **or shall have a history of successful use in Project's area.**
 - 7. Size (Actual Dimensions): 3-5/8 inches wide by 2-1/4 inches high by 8 inches long.
 - 8. Color and Texture: **As selected by Architect.**
- C. NOT USED.

2.4 NOT USED

2.5 NOT USED

2.6 MORTAR MATERIALS

- A. Portland Cement: ASTM C 150/C 150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
 - 1. Alkali content shall not be more than 0.1 percent when tested according to ASTM C 114.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- D. Masonry Cement: ASTM C 91/C 91M.
- E. Mortar Cement: ASTM C 1329/C 1329M.
- F. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979/C 979M. Use only pigments with a record of satisfactory performance in masonry mortar.
- G. Colored Cement Products: Packaged blend made from portland cement and hydrated lime, masonry cement or mortar cement and mortar pigments, all complying with specified requirements, and containing no other ingredients.
- H. Aggregate for Mortar: ASTM C 144.
 - 1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
 - 2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
 - 3. White-Mortar Aggregates: Natural white sand or crushed white stone.
 - 4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
- I. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

- J. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs containing integral water repellent from same manufacturer.
- K. Water: Potable.

2.7 TIES AND ANCHORS

- A. General: Ties and anchors shall extend at least 1-1/2 inches into veneer but with at least a 5/8-inch cover on outside face.
- B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:
 - 1. Mill-Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M, with ASTM A 641/A 641M, Class 1 coating.
 - 2. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M, with ASTM A 153/A 153M, Class B-2 coating.
 - 3. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304.
 - 4. Galvanized-Steel Sheet: ASTM A 653/A 653M, Commercial Steel, G60 zinc coating.
 - 5. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.
 - 6. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304.
- C. NOT USED.
- D. NOT USED.
- E. NOT USED.
- F. Adjustable Masonry-Veneer Anchors:
 - 1. General: Provide anchors that allow vertical adjustment but resist a 100-lbf load in both tension and compression perpendicular to plane of wall without deforming or developing play in excess of 1/16 inch.
 - 2. Fabricate sheet metal anchor sections and other sheet metal parts from 0.075-inch-thick steel sheet, galvanized after fabrication.
 - 3. Fabricate wire ties from 0.187-inch-diameter, hot-dip galvanized-steel or stainless-steel wire unless otherwise indicated.
 - 4. Fabricate wire connector sections from 0.187-inch-diameter, hot-dip galvanized, carbon or stainless-steel wire.

2.8 EMBEDDED FLASHING MATERIALS

- A. Metal Flashing: Provide metal flashing complying with **SMACNA's "Architectural Sheet Metal Manual"** and as follows:
1. Stainless Steel: ASTM A 240/A 240M or ASTM A 666, Type 304, 0.016 inch thick.
 2. Copper: ASTM B 370, Temper H00, cold-rolled copper sheet, 16-oz./sq. ft. weight or 0.0216 inch thick or ASTM B 370, Temper H01, high-yield copper sheet, 12-oz./sq. ft. weight or 0.0162 inch thick.
 3. Fabricate continuous flashings in sections 96 inches long minimum, but not exceeding 12 feet. Provide splice plates at joints of formed, smooth metal flashing.
 4. Fabricate through-wall metal flashing embedded in masonry from **copper**, with ribs at 3-inch (76-mm) intervals along length of flashing to provide an integral mortar bond.
 5. Fabricate through-wall flashing with snaplock receiver on exterior face where indicated to receive counterflashing.
 6. Fabricate through-wall flashing with drip edge **where** indicated. Fabricate by extending flashing 1/2 inch (13 mm) out from wall, with outer edge bent down 30 degrees **and hemmed**.
 7. Fabricate through-wall flashing with sealant stop **where** indicated. Fabricate by bending metal back on itself 3/4 inch (19 mm) at exterior face of wall and down into joint 1/4 inch (6 mm) to form a stop for retaining sealant backer rod.
 8. Fabricate metal **drip edges and sealant stops** for ribbed metal flashing from plain metal flashing of same metal as ribbed flashing and extending at least 3 inches (76 mm) into wall with hemmed inner edge to receive ribbed flashing and form a hooked seam. Form hem on upper surface of metal so that completed seam sheds water.
 9. Fabricate metal drip edges from stainless steel. Extend at least 3 inches (76 mm) into wall and 1/2 inch (13 mm) out from wall, with outer edge bent down 30 degrees **and hemmed**.
 10. Fabricate metal sealant stops from stainless steel. Extend at least 3 inches (76 mm) into wall and out to exterior face of wall. At exterior face of wall, bend metal back on itself for 3/4 inch (19 mm) and down into joint 1/4 inch (6 mm) to form a stop for retaining sealant backer rod.
 11. Fabricate metal expansion-joint strips from **copper** to shapes indicated.
 12. Solder metal items at corners.
- B. Flexible Flashing: Use **one of** the following unless otherwise indicated:
1. Copper-Laminated Flashing: **5-oz./sq. ft. (1.5-kg/sq. m)** sheet bonded between two layers of glass-fiber cloth. Use only where flashing is fully concealed in masonry.

2. Asphalt-Coated Copper Flashing: **5-oz./sq. ft. (1.5-kg/sq. m)** copper sheet coated with flexible asphalt. Use only where flashing is fully concealed in masonry.
 3. Rubberized-Asphalt Flashing: Composite flashing product consisting of a pliable, adhesive rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than **0.030 inch (0.76 mm)**
 - a. Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.
 4. Butyl Rubber Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than **0.030 inch (0.76 mm)**.
 - a. Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.
 5. Elastomeric Thermoplastic Flashing: Composite flashing product consisting of a polyester-reinforced ethylene interpolymer alloy.
 - a. Monolithic Sheet: Elastomeric thermoplastic flashing, 0.040 inch (1.02 mm) thick.
 - b. Self-Adhesive Sheet: Elastomeric thermoplastic flashing, 0.025 inch (0.64 mm) thick, with a 0.015-inch- (0.38-mm-) thick coating of adhesive.
 - c. Self-Adhesive Sheet with Drip Edge: Elastomeric thermoplastic flashing, 0.025 inch (0.64 mm) thick, with a 0.015-inch- (0.38-mm-) thick coating of rubberized-asphalt adhesive. Where flashing extends to face of masonry, rubberized-asphalt coating is held back approximately 1-1/2 inches (38 mm) from edge.
 - 1) Color: **Black**.
 - d. Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.
 6. EPDM Flashing: Sheet flashing product made from ethylene-propylene-diene terpolymer, complying with ASTM D 4637/D 4637M, 0.040 inch (1.02 mm) thick.
- C. Application: Unless otherwise indicated, use the following:
1. Where flashing is indicated to receive counterflashing, use metal flashing.
 2. Where flashing is indicated to be turned down at or beyond the wall face, use metal flashing.
 3. Where flashing is partly exposed and is indicated to terminate at the wall face, use metal flashing **with a drip edge**
 4. Where flashing is fully concealed, use **metal flashing**.

- D. Solder and Sealants for Sheet Metal Flashings: **As specified in Section 076200 "Sheet Metal Flashing and Trim."**
 - 1. Solder for Stainless Steel: ASTM B 32, **Grade Sn60**, with acid flux of type recommended by stainless-steel sheet manufacturer.
 - 2. Solder for Copper: ASTM B 32, **Grade Sn50 with maximum lead content of 0.2 percent.**
 - 3. Elastomeric Sealant: ASTM C 920, chemically curing **urethane** sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and remain watertight.
- E. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.
- F. Termination Bars for Flexible Flashing: **Aluminum** steel bars **1/8 inch by 1 inch (3 mm by 25 mm).**
- G. Termination Bars for Flexible Flashing: Stainless steel sheet 0.019 inch by 1-1/2 inches (0.48 mm by 38 mm) with a 3/8 inch (9.5 mm) sealant flange at top.
- H. Termination Bars for Flexible Flashing: Aluminum sheet 0.064 inch by 1-1/2 inches (01.6 mm by 38 mm) with a 3/8 inch (9.5 mm) sealant flange at top.

2.9 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from **urethane**.
- B. Weep/Vent Products: Use the following unless otherwise indicated:
 - 1. Wicking Material: Absorbent rope, made from **cotton**, 1/4 to 3/8 inch (6 to 10 mm) in diameter, in length required to produce 2-inch (50-mm) exposure on exterior and 18 inches (450 mm) in cavity. Use only for weeps.
 - 2. Round Plastic Weep/Vent Tubing: Medium-density polyethylene, 3/8-inch (9-mm) OD by 4 inches (100 mm) long.
 - 3. Rectangular Plastic Weep/Vent Tubing: Clear butyrate, 3/8 by 1-1/2 by 3-1/2 inches (9 by 38 by 89 mm) long.
 - 4. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch (3 mm) less than depth of outer wythe, in color selected from manufacturer's standard.

5. Mesh Weep/Vent: Free-draining mesh; made from polyethylene strands, full height and width of head joint and depth 1/8 inch (3 mm) less than depth of outer wythe; in color selected from manufacturer's standard.
 6. Aluminum Weep Hole/Vent: Units made from sheet aluminum, designed to fit into a head joint and consisting of a vertical channel, with louvers stamped in web and with a top flap to keep mortar out of the head joint; factory primed and painted before installation to comply with Section 099113 "Exterior Painting" in color selected by Architect.
 7. Vinyl Weep Hole/Vent: Units made from flexible PVC, designed to fit into a head joint and consisting of a louvered vertical leg, flexible wings to seal against ends of masonry units, and a top flap to keep mortar out of the head joint; in color selected by Architect.
- C. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.
1. Configuration: Provide one of the following:
 - a. Strips, full depth of cavity and 10 inches (250 mm) high, with dovetail-shaped notches 7 inches (175 mm) deep that prevent clogging with mortar droppings.
 - b. Strips, not less than **3/4 inch (19 mm)** thick and 10 inches (250 mm) high, with dimpled surface designed to catch mortar droppings and prevent weep holes from clogging with mortar.
 - c. Sheets or strips, full depth of cavity and installed to full height of cavity.
 - d. Sheets or strips not less than **3/4 inch (19 mm)** thick and installed to full height of cavity with additional strips 4 inches (100 mm) high at weep holes and thick enough to fill entire depth of cavity and prevent weep holes from clogging with mortar.

2.10 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

2.11 MORTAR MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
 - 1. Do not use calcium chloride in mortar or grout.
 - 2. Use portland cement-lime mortar unless otherwise indicated.
 - 3. For exterior masonry, use portland cement-lime mortar.
 - 4. For reinforced masonry, use portland cement-lime mortar.
 - 5. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Use Type N unless another type is indicated.
 - 1. For masonry below grade or in contact with earth, use Type S.
- D. Pigmented Mortar: Use colored cement product.
 - 1. Pigments shall not exceed 10 percent of portland cement by weight.
 - 2. Mix to match Architect's sample.
 - 3. Application: Use pigmented mortar for exposed mortar joints.
- E. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.
 - 1. Mix to match Architect's sample.
 - 2. Application: Use colored aggregate mortar for exposed mortar joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 - 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.
- B. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- C. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.
- D. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.
- E. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested according to ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

3.3 TOLERANCES

- A. Dimensions and Locations of Elements:
 - 1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch or minus 1/4 inch.
 - 2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
 - 3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.
- B. Lines and Levels:
 - 1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
 - 2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
 - 3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.

4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.
5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch from one masonry unit to the next.

3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in **bond pattern indicated on Drawings**; do not use units with less-than-nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.
- C. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- D. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

- E. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

3.5 MORTAR BEDDING AND JOINTING

- A. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- B. **Lay hollow brick with face** shells fully bedded in mortar and with head joints of depth equal to bed joints. At starting course, fully bed entire units, including area under cells.
 - 1. At anchors and ties, fully bed units and fill cells with mortar as needed to fully embed anchors and ties in mortar.
- C. NOT USED.
- D. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
 - 1. For glazed masonry units, use a nonmetallic jointer 3/4 inch or more in width.

3.6 ANCHORED MASONRY VENEERS

- A. Anchor masonry veneers to **wall framing** with **seismic** masonry-veneer anchors to comply with the structural drawings and the following requirements:
 - 1. Fasten screw-attached and seismic anchors through sheathing to wall framing with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
 - 2. Embed connector sections and continuous wire in masonry joints.
 - 3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
 - 4. Space as indicated in structural drawings.
- B. Provide not less than 1 inch of airspace between back of masonry veneer and face of insulation.
 - 1. Keep airspace clean of mortar droppings and other materials during construction. Bevel beds away from airspace, to minimize mortar protrusions into airspace. Do not attempt to trowel or remove mortar fins protruding into airspace.

3.7 NOT USED

3.8 EXPANSION JOINTS

- A. General: Install expansion-joint materials in unit masonry as masonry progresses. Do not allow materials to span expansion joints without provision to allow for in-plane wall or partition movement.
- B. Form expansion joints as follows:
 - 1. Build flanges of metal expansion strips into masonry. Lap each joint 4 inches in direction of water flow. Seal joints below grade and at junctures with horizontal expansion joints if any.
 - 2. Build flanges of factory-fabricated, expansion-joint units into masonry.
 - 3. Build in compressible joint fillers where indicated.
 - 4. Form open joint full depth of brick wythe and of width indicated, but not less than 3/8 inch for installation of sealant and backer rod.
- C. Provide horizontal, pressure-relieving joints by either leaving an airspace or inserting a compressible filler of width required for installing sealant and backer rod not less than 3/8 inch.

3.9 LINTELS

- A. Install steel lintels where indicated.
- B. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

3.10 FLASHING, WEEP HOLES, AND VENTS

- A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. **Install vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.**
- B. Install flashing as follows unless otherwise indicated:
 - 1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape **as recommended by flashing manufacturer.**

2. Extend flashing through veneer, across airspace behind veneer, and up face of sheathing at least 8 inches (200 mm); with upper edge tucked under **water-resistive barrier**, lapping at least 4 inches (100 mm). **Fasten upper edge of flexible flashing to sheathing through termination bar.**
 3. At lintels and shelf angles, extend flashing a minimum of 6 inches (150 mm) into masonry at each end. At heads and sills, extend flashing 6 inches (150 mm) at ends and turn up not less than 2 inches (50 mm) to form end dams.
 4. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 1-1/2 inches (38 mm) or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Section 079200 "Joint Sealants" for application indicated.
 5. Install metal **drip edges and sealant stops** with ribbed sheet metal flashing by interlocking hemmed edges to form hooked seam. Seal seam with elastomeric sealant complying with requirements in Section 079200 "Joint Sealants" for application indicated.
 6. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch (13 mm) back from outside face of wall, and adhere flexible flashing to top of metal drip edge.
 7. Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch (13 mm) back from outside face of wall, and adhere flexible flashing to top of metal flashing termination.
 8. Cut flexible flashing off flush with face of wall after masonry wall construction is completed.
- C. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.
- D. Install weep holes in veneers in head joints of first course of masonry immediately above embedded flashing.
1. Use **open-head joints** to form weep holes.
 2. Use wicking material to form weep holes above flashing under brick sills. Turn wicking down at lip of sill to be as inconspicuous as possible.
 3. Space weep holes 24 inches (600 mm) o.c. unless otherwise indicated.
 4. Space weep holes formed from **plastic tubing** 16 inches (400 mm) o.c.
 5. Cover cavity side of weep holes with plastic insect screening at cavities insulated with loose-fill insulation.
 6. Trim wicking material flush with outside face of wall after mortar has set.
- E. Place cavity drainage material in airspace behind veneers to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.

- F. Install vents in head joints in exterior wythes at spacing indicated. [**open-head joints**] to form vents.
 - 1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

3.11 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
- B. Inspections: Special inspections according to Level B in TMS 402/ACI 530/ASCE 5.
 - 1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
- C. Testing Prior to Construction: One set of tests.
- D. Clay Masonry Unit Test: For each type of unit provided, according to ASTM C 67 for compressive strength.
- E. NOT USED.
- F. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.
- G. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for mortar air content and compressive strength.

3.12 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
 - 3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
 - 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
 - 5. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
 - 6. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
 - 7. Clean stone trim to comply with stone supplier's written instructions.
 - 8. Clean limestone units to comply with recommendations in ILI's "Indiana Limestone Handbook."

3.13 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.
- B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
 - 1. Crush masonry waste to less than 4 inches in each dimension.
 - 2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Section 312000 "Earth Moving."
 - 3. Do not dispose of masonry waste as fill within 18 inches of finished grade.
- C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 042613

SECTION 051200
STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Structural steel.
 - 2. Prefabricated building columns.
 - 3. Field-installed shear connectors.
 - 4. Grout.
- B. Related Requirements:
 - 1. Section 051213 "Architecturally Exposed Structural Steel Framing" for additional requirements for architecturally exposed structural steel.
 - 2. Section 053100 "Steel Decking" for field installation of shear connectors through deck.
 - 3. NOT USED
 - 4. NOT USED
 - 5. NOT USED

1.3 DEFINITIONS

- A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."
- B. Seismic-Load-Resisting System: Elements of structural-steel frame designated as "SLRS" or along grid lines designated as "SLRS" on Drawings, including columns, beams, and braces and their connections.
- C. Heavy Sections: Rolled and built-up sections as follows:
 - 1. Shapes included in ASTM A 6/A 6M with flanges thicker than 1-1/2 inches .
 - 2. Welded built-up members with plates thicker than 2 inches.

- 3. Column base plates thicker than 2 inches.
- D. Protected Zone: Structural members or portions of structural members indicated as "Protected Zone" on Drawings. Connections of structural and nonstructural elements to protected zones are limited.
- E. Demand Critical Welds: Those welds, the failure of which would result in significant degradation of the strength and stiffness of the Seismic-Load-Resisting System and which are indicated as "Demand Critical" or "Seismic Critical" on Drawings.

1.4 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. NOT USED
- C. Shop Drawings: Show fabrication of structural-steel components.
 - 1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 - 2. Include embedment Drawings.
 - 3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
 - 4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.
 - 5. Identify members and connections of the Seismic-Load-Resisting System.
 - 6. Indicate locations and dimensions of protected zones.
 - 7. Identify demand critical welds.

- D. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for each welded joint whether prequalified or qualified by testing, including the following:
 - 1. Power source (constant current or constant voltage).
 - 2. Electrode manufacturer and trade name, for demand critical welds.
- E. Delegated-Design Submittal: For structural-steel connections indicated to comply with design loads, include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer, fabricator, professional engineer and testing agency.
- B. Welding certificates.
- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- D. Mill test reports for structural steel, including chemical and physical properties.
- E. Product Test Reports: For the following:
 - 1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
 - 2. Direct-tension indicators.
 - 3. Tension-control, high-strength, bolt-nut-washer assemblies.
 - 4. Shear stud connectors.
 - 5. Shop primers.
 - 6. Nonshrink grout.
- F. Survey of existing conditions.
- G. Source quality-control reports.
- H. Field quality-control and special inspection reports.

1.8 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD, or is accredited by the IAS Fabricator Inspection Program for Structural Steel (AC 172).

- B. Erector Qualifications: A qualified steel erector who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE.
 - 1. Alternate means of compliance
 - a. In lieu of the AISC-Certified erector option noted above, the erector shall provide the following documentation to satisfy the requirement:
 - 1) Written quality control (QC) and quality assurance (QA) plan outlining their internal erection practices to meet the quality of work required and expected by the owner to complete the project successfully. The QA/QC plan shall address the following as a minimum:
 - a) Management responsibility and organization.
 - b) Contract and project specification review and communication.
 - c) Document and data control procedures.
 - d) Erection process control procedures.
 - e) Inspection and testing procedures.
 - f) Calibration of inspection, measuring, and test equipment.
 - g) Handling, storage, and delivery of product and material procedures.
 - 2) List a minimum of three (3) relevant projects of similar size, type, and complexity successfully completed by the fabricator.
- C. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector Category ACSE.
- D. Shop-Painting Applicators: Qualified according to AISC's Sophisticated Paint Endorsement P3 or to SSPC-QP 3, "Standard Procedure for Evaluating Qualifications of Shop Painting Applicators."
- E. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 1. Welders and welding operators performing work on bottom-flange, demand-critical welds shall pass the supplemental welder qualification testing, as required by AWS D1.8/D1.8M. FCAW-S and FCAW-G shall be considered separate processes for welding personnel qualification.
- F. Comply with applicable provisions of the following specifications and documents:
 - 1. AISC 303.
 - 2. AISC 341 and AISC 341s1.
 - 3. AISC 360.
 - 4. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
 - 1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.
- B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
 - 1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
 - 2. Clean and relubricate bolts and nuts that become dry or rusty before use.
 - 3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

PART 2 - PRODUCTS

2.1 NOT USED

STRUCTURAL-STEEL MATERIALS

- A. W-Shapes: See structural drawings.
- B. Channels, Angles-Shapes: See structural drawings
- C. Plate and Bar: See structural drawings.
- D. NOT USED.
- E. Cold-Formed Hollow Structural Sections: See structural drawings.
- F. NOT USED.
- G. NOT USED.
- H. NOT USED.
- I. NOT USED.
- J. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers; all with plain finish.
 - 1. Direct-Tension Indicators: ASTM F 959, Type 325, compressible-washer type with plain finish.
- B. NOT USED.
- C. NOT USED.
- D. NOT USED.
- E. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.
- F. Unheaded Anchor Rods: See structural drawings.
 - 1. Configuration: See structural drawings.
 - 2. Nuts: ASTM A 563 hex carbon steel.
 - 3. Plate Washers: ASTM A 36/A 36M carbon steel.
 - 4. Washers: ASTM F 436, Type 1, hardened carbon steel.
 - 5. Finish: Plain.
- G. Headed Anchor Rods: See structural drawings.
 - 1. Nuts: ASTM A 563 hex carbon steel.
 - 2. Plate Washers: ASTM A 36/A 36M carbon steel.
 - 3. Washers: ASTM F 436, Type 1, hardened carbon steel.
 - 4. Finish: Plain.
- H. Threaded Rods: See structural drawings.
 - 1. Nuts: ASTM A 563 hex carbon steel.
 - 2. Washers: ASTM F 436 carbon steel.
 - 3. Finish: Plain.
- I. Clevises and Turnbuckles: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1035.
- J. Eye Bolts and Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1030.
- K. Sleeve Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1018.

- L. NOT USED.

2.3 PRIMER

- A. Primer: SSPC-Paint 25, Type I or Type II, zinc oxide, alkyd, linseed oil primer.
- B. Galvanizing Repair Paint: MPI#18, MPI#19, or SSPC-Paint 20.

2.4 GROUT

- A. Metallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, metallic aggregate grout, mixed with water to consistency suitable for application and a 30-minute working time.

2.5 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," and to AISC 360.
 - 1. Camber structural-steel members where indicated.
 - 2. Fabricate beams with rolling camber up.
 - 3. Identify high-strength structural steel according to ASTM A 6/A 6M and maintain markings until structural steel has been erected.
 - 4. Mark and match-mark materials for field assembly.
 - 5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
- B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
 - 1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.
- C. Bolt Holes: Cut, drill, mechanically thermal cut, or punch standard bolt holes perpendicular to metal surfaces.
- D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
- E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 3, "Power Tool Cleaning."

- F. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.
- G. Steel Wall-Opening Framing: Select true and straight members for fabricating steel wall-opening framing to be attached to structural-steel frame. Straighten as required to provide uniform, square, and true members in completed wall framing. Build up welded framing, weld exposed joints continuously, and grind smooth.
- H. Welded Door Frames: Build up welded door frames attached to structural-steel frame. Weld exposed joints continuously and grind smooth. Plug-weld fixed steel bar stops to frames. Secure removable stops to frames with countersunk machine screws, uniformly spaced not more than 10 inches o.c. unless otherwise indicated.
- I. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.
 - 1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
 - 2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
 - 3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.6 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Snug tightened.
- B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
 - 1. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

2.7 NOT USED

2.8 SHOP PRIMING

- A. Shop prime steel surfaces except the following:
 - 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
 - 2. Surfaces to be field welded.
 - 3. Surfaces of high-strength bolted, slip-critical connections.
 - 4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
 - 5. Galvanized surfaces.
 - 6. Surfaces enclosed in interior construction.
- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
 - 1. SSPC-SP 3, "Power Tool Cleaning."
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
 - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
 - 2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.
- D. Painting: Prepare steel and apply a one-coat, nonasphaltic primer complying with SSPC-PS Guide 7.00, "Painting System Guide 7.00: Guide for Selecting One-Coat Shop Painting Systems," to provide a dry film thickness of not less than 1.5 mils.

2.9 NOT USED

2.10 SOURCE QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform shop tests and inspections.
 - 1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
- B. Bolted Connections: Inspect and test shop-bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

- C. Welded Connections: Visually inspect shop-welded connections according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
 - 1. Liquid Penetrant Inspection: ASTM E 165.
 - 2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
 - 3. Ultrasonic Inspection: ASTM E 164.
 - 4. Radiographic Inspection: ASTM E 94.
- D. In addition to visual inspection, test and inspect shop-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
 - 1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
 - 2. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.
- E. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
 - 1. Prepare a certified survey of existing conditions. Include bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.
 - 1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.
- B. Baseplates Bearing Plates and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
 - 1. Set plates for structural members on wedges, shims, or setting nuts as required.
 - 2. Weld plate washers to top of baseplate.
 - 3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
 - 4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- C. Maintain erection tolerances of structural steel within AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."
- D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 - 1. Level and plumb individual members of structure.
 - 2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.
- E. Splice members only where indicated.
- F. Do not use thermal cutting during erection unless approved by engineer and architect. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M.
- G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.
- H. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

3.4 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Snug tightened.
- B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
 - 1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
 - 2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
 - 3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," for mill material.

3.5 PREFABRICATED BUILDING COLUMNS

- A. Install prefabricated building columns to comply with AISC 360, manufacturer's written recommendations, and requirements of testing and inspecting agency that apply to the fire-resistance rating indicated.

3.6 FIELD QUALITY CONTROL

- A. Special Inspections: Engage a qualified special inspector to perform the following special inspections:
 - 1. Verify structural-steel materials and inspect steel frame joint details.
 - 2. Verify weld materials and inspect welds.
 - 3. Verify connection materials and inspect high-strength bolted connections.
- B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- C. Bolted Connections: Inspect and test bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- D. Welded Connections: Visually inspect field welds according to AWS D1.1/D1.1M.
 - 1. In addition to visual inspection, test and inspect field welds according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

- a. Liquid Penetrant Inspection: ASTM E 165.
 - b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
 - c. Ultrasonic Inspection: ASTM E 164.
 - d. Radiographic Inspection: ASTM E 94.
- E. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
- 1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
 - 2. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.

3.7 REPAIRS AND PROTECTION

- A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780/A 780M.
- B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
- C. Touchup Painting: Cleaning and touchup painting are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
- D. Touchup Priming: Cleaning and touchup priming are specified in Section 099600 "High-Performance Coatings."

END OF SECTION 051200

**SECTION 052100
STEEL JOIST FRAMING**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. K-series steel joists.
 - 2. KCS-type K-series steel joists.
 - 3. K-series steel joist substitutes.
 - 4. LH- and DLH-series long-span steel joists.
 - 5. CJ-series composite steel joists.
 - 6. Joist girders.
 - 7. Joist accessories.
- B. Related Requirements:
 - 1. Section 033000 "Cast-in-Place Concrete" for installing bearing plates in concrete.
 - 2. NOT USED
 - 3. Section 051200 "Structural Steel Framing" for field-welded shear connectors.

1.3 DEFINITIONS

- A. SJI's "Specifications": Steel Joist Institute's "Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders."
- B. Special Joists: Steel joists or joist girders requiring modification by manufacturer to support nonuniform, unequal, or special loading conditions that invalidate load tables in SJI's "Specifications."

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of joist, accessory, and product.

- B. NOT USED.
- C. Shop Drawings:
 - 1. Include layout, designation, number, type, location, and spacing of joists.
 - 2. Include joining and anchorage details, bracing, bridging, and joist accessories; splice and connection locations and details; and attachments to other construction.
 - 3. Indicate locations and details of bearing plates to be embedded in other construction.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.
- B. Welding certificates.
- C. Manufacturer certificates.
- D. Mill Certificates: For each type of bolt.
- E. Comprehensive engineering analysis of special joists signed and sealed by the qualified professional engineer responsible for its preparation.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer certified by SJI to manufacture joists complying with applicable standard specifications and load tables in SJI's "Specifications."
 - 1. Manufacturer's responsibilities include providing professional engineering services for designing special joists to comply with performance requirements.
- B. Welding Qualifications: Qualify field-welding procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle joists as recommended in SJI's "Specifications."
- B. Protect joists from corrosion, deformation, and other damage during delivery, storage, and handling.

1.8 SEQUENCING

- A. Deliver steel bearing plates to be built into cast-in-place concrete construction.

1.9 BLAST RESISTANCE

- A. Minimum Section Properties for Flexure: Minimum section properties of joists have been determined based on the required performance under air-blast analysis. Section properties required are specified based on support conditions, joist span, and spacing.
 - 1. Simple Supports, Span \leq 29.5-ft & Spacing \leq 4-ft
 - a. Target Effective Moment of Inertia, $I_x \geq 60.12 \text{ in}^4$
 - b. Plastic Section Modulus, $Z_x \geq 9.03 \text{ in}^3$
 - c. Elastic Section Modulus, $S_x \geq 7.94 \text{ in}^3$
 - 2. Simple Supports, Span \leq 26-ft & Spacing \leq 4-ft
 - a. Target Effective Moment of Inertia, $I_x \geq 42.8 \text{ in}^4$
 - b. Plastic Section Modulus, $Z_x \geq 6.97 \text{ in}^3$
 - c. Elastic Section Modulus, $S_x \geq 6.93 \text{ in}^3$
 - 3. Simple Supports, Span \leq 21-ft & Spacing \leq 4-ft
 - a. Target Effective Moment of Inertia, $I_x \geq 30.9 \text{ in}^4$
 - b. Plastic Section Modulus, $Z_x \geq 5.94 \text{ in}^3$
 - c. Elastic Section Modulus, $S_x \geq 5.88 \text{ in}^3$
- B. Shear Capacity: Shear capacity is governed by the minimum of the capacity of the web members, web connections, or support connections. The shear capacity must be greater than 1.11 times the flexural moment capacity of the section, where the flexural moment capacity is calculated using the design length, actual plastic section modulus, and yield strength defined in Section 1.04-C. Shear capacity requirements shall consider response of truss under inbound and rebound load conditions.
- C. Material Strength: Yield strength of steel elements with $f_y \leq 50\text{-ksi}$ shall be increased by the average strength increase factor of 1.1.
- D. Support Connection Design: Connections shall be designed to develop the flexural moment capacity calculated per Section 1.04-B. Reactions associated with the flexural moment capacity can be considered ultimate level loads and connections designed using LRFD methods with load increase factors equal to 1.0. Connection design requirements are applicable to inbound and rebound load conditions.
- E. Bracing/Bridging: Provide sufficient bracing of top and bottom chords to prevent lateral buckling. Provide additional anchors as needed to prevent pull-out failures.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide special joists and connections capable of withstanding design loads indicated.
 - 1. Use ASD; data are given at service-load level.
 - 2. Design special joists to withstand design loads with live-load deflections no greater than the following:
 - a. Roof Joists: Vertical deflection of 1/360 of the span.

2.2 K-SERIES STEEL JOISTS

- A. Manufacture steel joists of type indicated according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members, underslung ends, and parallel top chord.
 - 1. Joist Type: K-series steel joists.
- B. Steel Joist Substitutes: Manufacture according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle or -channel members.
- C. Provide holes in chord members for connecting and securing other construction to joists.
- D. Top-Chord Extensions: Extend top chords of joists with SJI's Type S top-chord extensions where indicated, complying with SJI's "Specifications."
- E. Extended Ends: Extend bearing ends of joists with SJI's Type R extended ends where indicated, complying with SJI's "Specifications."
- F. Do not camber joists.
- G. Camber joists according to SJI's "Specifications."
- H. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches.

2.3 LONG-SPAN STEEL JOISTS

- A. Manufacture steel joists according to "Standard Specifications for Longspan Steel Joists, LH-Series and Deep Longspan Steel Joists, DLH-Series" in SJI's "Specifications," with

steel-angle top- and bottom-chord members; of joist type and end and top-chord arrangements as indicated in structural drawings.

- B. Provide holes in chord members for connecting and securing other construction to joists.
- C. Camber long-span steel joists according to SJI's "Specifications."
- D. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches.

2.4 NOT USED

2.5 NOT USED

2.6 PRIMERS

- A. Primer: SSPC-Paint 15, or manufacturer's standard shop primer complying with performance requirements in SSPC-Paint 15.
- B. Primer: Provide shop primer that complies with Section 099100 "Painting".

2.7 JOIST ACCESSORIES

- A. Bridging: Provide bridging anchors and number of rows of horizontal or diagonal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span. Furnish additional erection bridging if required for stability. See structural drawings for additional bridging requirements.
- B. Fabricate steel bearing plates from ASTM A 36/A 36M steel with integral anchorages of sizes and thicknesses indicated. Shop prime paint.
- C. Furnish ceiling extensions, either extended bottom-chord elements or a separate extension unit of enough strength to support ceiling construction. Extend ends to within 1/2 inch of finished wall surface unless otherwise indicated.
- D. Carbon-Steel Bolts and Threaded Fasteners: ASTM A 307, Grade A, carbon-steel, hex-head bolts and threaded fasteners; carbon-steel nuts; and flat, unhardened steel washers.
 - 1. Finish: Plain, uncoated.

- E. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy hex steel structural bolts; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.
 - 1. Finish: Plain.
- F. Welding Electrodes: Comply with AWS standards.
- G. Galvanizing Repair Paint: MPI#18, MPI#19, or SSPC-Paint 20.
- H. Furnish miscellaneous accessories including splice plates and bolts required by joist manufacturer to complete joist assembly.

2.8 CLEANING AND SHOP PAINTING

- A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories by power-tool cleaning, SSPC-SP 3.
- B. Do not prime paint joists and accessories to receive sprayed fire-resistive materials.
- C. Apply one coat of shop primer to joists and joist accessories to be primed to provide a continuous, dry paint film not less than 1 mil thick.
- D. Shop priming of joists and joist accessories is specified in Section 099100 "Painting".

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting substrates, embedded bearing plates, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Do not install joists until supporting construction is in place and secured.
- B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications," joist manufacturer's written recommendations, and requirements in this Section.

1. Before installation, splice joists delivered to Project site in more than one piece.
 2. Space, adjust, and align joists accurately in location before permanently fastening.
 3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
 4. Delay rigidly connecting bottom-chord extensions to columns or supports until dead loads are applied.
- C. Field weld joists to supporting steel bearing plates and framework. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
- D. Bolt joists to supporting steel framework using carbon-steel bolts.
- E. Bolt joists to supporting steel framework using high-strength structural bolts. Comply with Research Council on Structural Connection's "Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts" for high-strength structural bolt installation and tightening requirements.
- F. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and bolted connections and to perform field tests and inspections and prepare test and inspection reports.
- B. Visually inspect field welds according to AWS D1.1/D1.1M.
1. In addition to visual inspection, test field welds according to AWS D1.1/D1.1M and the following procedures, as applicable:
 - a. Liquid Penetrant Inspection: ASTM E 165.
 - b. Magnetic Particle Inspection: ASTM E 709.
 - c. Ultrasonic Testing: ASTM E 164.
 - d. Radiographic Testing: ASTM E 94.
- C. Visually inspect bolted connections.
- D. Correct deficiencies in Work that test and inspection reports have indicated are not in compliance with specified requirements.

- E. Perform additional testing to determine compliance of corrected Work with specified requirements.

3.4 PROTECTION

- A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists, bearing plates, abutting structural steel, and accessories.
 - 1. Clean and prepare surfaces by hand-tool cleaning according to SSPC-SP 2, or power-tool cleaning according to SSPC-SP 3.
 - 2. Apply a compatible primer of same type as primer used on adjacent surfaces.
- C. Touchup Painting: Cleaning and touchup painting are specified in Section 099100 "Painting".
- D. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that joists and accessories are without damage or deterioration at time of Substantial Completion.

END OF SECTION 052100

**SECTION 053100
STEEL DECKING**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Roof deck.
- 2. NOT USED
- 3. NOT USED
- 4. NOT USED
- 5. NOT USED
- 6. NOT USED
- 7. NOT USED
- 8. NOT USED

- B. Related Requirements:

- 1. Section 033000 "Cast-in-Place Concrete" for normal-weight and lightweight structural concrete fill over steel deck.
- 2. NOT USED
- 3. Section 051200 "Structural Steel Framing" for shop- and field-welded shear connectors.
- 4. NOT USED
- 5. Section 099100 "Painting" for repair painting of primed deck and finish painting of deck.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of deck, accessory, and product indicated.
- B. NOT USED
- C. Shop Drawings:

1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.4 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Product Certificates: For each type of steel deck.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that each of the following complies with requirements:
 1. Power-actuated mechanical fasteners.
 2. Acoustical roof deck.
- D. Evaluation Reports: For steel deck.
- E. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
- B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code - Sheet Steel."
- C. NOT USED
- D. FM Global Listing: Provide steel roof deck evaluated by FM Global and listed in its "Approval Guide, Building Materials" for Class 1 fire rating and Class 1-90 windstorm ratings.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.
 1. Protect and ventilate acoustical cellular roof deck with factory-installed insulation to maintain insulation free of moisture.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."
- B. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.
- C. NOT USED

2.2 ROOF DECK

- A. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:
 - 1. Galvanized and Shop-Primed Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade as indicated, G60 zinc coating; cleaned, pretreated, and primed with manufacturer's standard baked-on, rust-inhibitive primer.
 - a. Color: As Selected
 - b. Deck Profile: As indicated.

2.3 NOT USED

2.4 NOT USED

2.5 NOT USED

2.6 NOT USED

2.7 NOT USED

2.8 ACCESSORIES

- A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.
- C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.
- D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.
- E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.
- F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 31 for overhang and slab depth.
- G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.
- H. Piercing Hanger Tabs: Piercing steel sheet hanger attachment devices for use with floor deck.
- I. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, 0.0598 thick, with factory-punched hole of 3/8-inch minimum diameter.
- J. Flat Sump Plates: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck. For drains, cut holes in the field.

- K. Recessed Sump Pans: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck, with 3-inch- wide flanges and sloped recessed pans of 1-1/2-inch minimum depth. For drains, cut holes in the field.
- L. Galvanizing Repair Paint: ASTM A 780.
- M. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.
- B. Install temporary shoring before placing deck panels if required to meet deflection limitations.
- C. Locate deck bundles to prevent overloading of supporting members.
- D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
 - 1. Align cellular deck panels over full length of cell runs and align cells at ends of abutting panels.
- E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.
- G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

- H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.
- I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

3.3 ROOF-DECK INSTALLATION

- A. Fasten roof-deck panels to steel supporting members as indicated in structural drawings.
- B. Side-Lap and Perimeter Edge Fastening as indicated in structural drawings.
- C. End Bearing as indicated in structural drawings.
- D. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and weld flanges to top of deck. Space welds not more than 12 inches apart with at least one weld at each corner.
 - 1. Install reinforcing channels or zees in ribs to span between supports and weld.
- E. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld to substrate to provide a complete deck installation.
 - 1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.
- F. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.
- G. NOT USED

3.4 NOT USED

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Field welds will be subject to inspection.
- C. Testing agency will report inspection results promptly and in writing to Contractor and Architect.

- D. Remove and replace work that does not comply with specified requirements.
- E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.6 PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint.
 - 1. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.
 - 2. Wire brushing, cleaning, and repair painting of bottom deck surfaces are included in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
- C. Repair Painting: Wire brushing, cleaning, and repair painting of rust spots, welds, and abraded areas of both deck surfaces are included in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
- D. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION 053100

**SECTION 054000
COLD-FORMED METAL FRAMING**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Load-bearing wall framing.
 - 2. Exterior non-load-bearing wall framing.
 - 3. Floor joist framing.
 - 4. Roof rafter framing.
 - 5. Ceiling joist framing.
 - 6. Soffit framing.
- B. Related Requirements:
 - 1. NOT USED
 - 2. NOT USED
 - 3. NOT USED

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of cold-formed steel framing product and accessory.
- B. NOT USED
- C. Shop Drawings:

1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
 2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
- D. Delegated-Design Submittal: For cold-formed steel framing.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Welding certificates.
- C. Product Test Reports: For each listed product, for tests performed by manufacturer and witnessed by a qualified testing agency.
1. Steel sheet.
 2. Expansion anchors.
 3. Power-actuated anchors.
 4. Mechanical fasteners.
 5. Vertical deflection clips.
 6. Horizontal drift deflection clips
 7. Miscellaneous structural clips and accessories.
- D. Research Reports: For non-standard cold-formed steel framing, from ICC-ES.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
- B. Product Tests: Mill certificates or data from a qualified independent testing agency or in-house testing with calibrated test equipment indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.
- C. Welding Qualifications: Qualify procedures and personnel according to the following:
1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."
- D. Comply with AISI S230 "Standard for Cold-Formed Steel Framing - Prescriptive Method for One and Two Family Dwellings."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect cold-formed steel framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide cold-formed metal framing by one of the following
 - 1. Dietrich Metal Framing; a Worthington Industries Company.
 - 2. SCAFCO Corporation.
 - 3. Steeler, Inc.
 - 4. Or Approved Equal

2.2 NOT USED

2.3 COLD-FORMED STEEL FRAMING, GENERAL

- A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
 - 1. Grade: As indicated.
 - 2. Coating: G60.
- B. Steel Sheet for Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
 - 1. Grade: As required by structural performance.
 - 2. Coating: G60.

2.4 NOT USED

2.5 EXTERIOR NON-LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: as indicated in structural drawings.

2. Flange Width: as indicated in structural drawings.
 - B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
 1. Minimum Base-Metal Thickness: as indicated in structural drawings.
 2. Flange Width: as indicated in structural drawings.
 - C. Vertical Deflection Clips: Manufacturer's standard clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
 - D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:
 1. Minimum Base-Metal Thickness: as indicated in structural drawings.
 2. Flange Width: as indicated in structural drawings.
 - E. NOT USED.
 - F. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.
- 2.6 NOT USED**
- 2.7 NOT USED**
- 2.8 NOT USED**
- 2.9 SOFFIT FRAMING**
- A. Exterior Soffit Frame: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and as follows:
 1. Minimum Base-Metal Thickness: as indicated in drawings
 2. Flange Width: as indicated in drawings.

2.10 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.
- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
 - 1. Supplementary framing.
 - 2. Bracing, bridging, and solid blocking.
 - 3. Web stiffeners.
 - 4. Anchor clips.
 - 5. End clips.
 - 6. Foundation clips.
 - 7. Gusset plates.
 - 8. Stud kickers and knee braces.
 - 9. Joist hangers and end closures.
 - 10. Hole reinforcing plates.
 - 11. Backer plates.

2.11 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.
- B. Anchor Bolts: as indicated in drawings.
- C. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E 488 conducted by a qualified testing agency.
- D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.
- E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.
 - 1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

- F. Welding Electrodes: Comply with AWS standards.

2.12 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: SSPC-Paint 20 or MIL-P-21035B.
- B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.
- C. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107/C 1107M, with fluid consistency and 30-minute working time.
- D. Shims: Load bearing, high-density multimonomer plastic, and nonleaching; or of cold-formed steel of same grade and coating as framing members supported by shims.
- E. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.13 FABRICATION

- A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
 - 1. Fabricate framing assemblies using jigs or templates.
 - 2. Cut framing members by sawing or shearing; do not torch cut.
 - 3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by no fewer than three exposed screw threads.
 - 4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.

- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.
- C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
 - 1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
 - 2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.
- B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.
- C. Install load bearing shims or grout between the underside of load-bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch to ensure a uniform bearing surface on supporting concrete or masonry construction.
- D. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

- A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed steel framing according to AISI S200 and to manufacturer's written instructions unless more stringent requirements are indicated.
- C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
 - 1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.
- D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
 - 1. Cut framing members by sawing or shearing; do not torch cut.
 - 2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.
- E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.
- F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- G. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.
- H. Install insulation, specified in Section 072100 "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

- I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.
- J. Erection Tolerances: Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
 - 1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 NOT USED

3.5 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.
- B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs as follows:
 - 1. Stud Spacing: as indicated in drawings.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.
- D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
 - 1. Install single deep-leg deflection tracks and anchor to building structure.
 - 2. Install double deep-leg deflection tracks and anchor outer track to building structure.
 - 3. Connect vertical deflection clips to studs and anchor to building structure.
 - 4. Connect drift clips to cold-formed metal framing and anchor to building structure.
- E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.
 - 1. Top Bridging for Single Deflection Track: Install bridging as indicated in drawings.
 - a. Install solid blocking as indicated in drawings.
 - 2. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.

3. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
 4. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.
- F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.6 NOT USED

3.7 FIELD QUALITY CONTROL

- A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Field and shop welds will be subject to testing and inspecting.
- C. Testing agency will report test results promptly and in writing to Contractor and Architect.
- D. Remove and replace work where test results indicate that it does not comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.8 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 054000

**SECTION 054400
COLD-FORMED METAL TRUSSES**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Cold-formed steel trusses for roofs.
 - 2. Cold-formed steel trusses for floors.
- B. Related Requirements:
 - 1. Section 054000 "Cold-Formed Metal Framing" for cold-formed steel studs, joists, and rafters.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. NOT USED
- C. Shop Drawings:
 - 1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel trusses; fabrication; and fastening and anchorage details, including mechanical fasteners.
 - 2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
- D. Delegated-Design Submittal: For cold-formed steel trusses.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Welding certificates.
- C. Product Test Reports: For each listed product, for tests performed by manufacturer and witnessed by a qualified testing agency.
 - 1. Steel sheet.
 - 2. Expansion anchors.
 - 3. Power-actuated anchors.
 - 4. Mechanical fasteners.
 - 5. Miscellaneous structural clips and accessories.
- D. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
- B. Product Tests: Mill certificates or data from a qualified testing agency, or in-house testing with calibrated test equipment, indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.
- C. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect cold-formed steel trusses from corrosion, deformation, and other damage during delivery, storage, and handling.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design cold-formed steel framing.

- B. Structural Performance: Provide cold-formed steel trusses capable of withstanding design loads within limits and under conditions indicated.
 - 1. Design Loads: As indicated in drawings.
 - 2. Deflection Limits: Design trusses to withstand design loads without deflections greater than the following:
 - a. Floor Trusses: Vertical deflection of $1/480$ for live loads and $1/360$ for total loads of the span.
 - b. Roof Trusses: Vertical deflection of $1/240$ of the span.
 - c. Scissor Roof Trusses: Horizontal deflection of $1-1/4$ inches at reactions.
 - 3. Design framing systems to provide for movement of framing members located outside the insulated building envelope without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.
- C. Cold-Formed Steel Framing Design Standards:
 - 1. Floor and Roof Systems: Design according to AISI S210.
 - 2. Lateral Design: Design according to AISI S213.
 - 3. Roof Trusses: Design according to AISI S214.
- D. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 COLD-FORMED STEEL TRUSS MATERIALS

- A. Steel Sheet: ASTM A 1003/A 1003M, structural grade, Type H, metallic coated, of grade and coating weight as follows:
 - 1. Grade: As required by structural performance.
 - 2. Coating: G60, A60, AZ50, or GF30.

2.3 ROOF TRUSSES

- A. Roof Truss Members: Manufacturer's standard C-shaped steel sections.
 - 1. Connecting Flange Width: $1-5/8$ inches, minimum at top and bottom chords connecting to sheathing or other directly fastened construction.

2. Minimum Base-Metal Thickness: as required by performance requirements.
3. Section Properties: as required by performance requirement.

2.4 NOT USED

2.5 ACCESSORIES

- A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, structural grade, Type H, metallic coated, of same grade and coating weight used for truss members.
- B. Provide accessories of manufacturer's standard thickness and configuration unless otherwise indicated.

2.6 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.
- B. Anchor Bolts: as required by performance requirement or indicated in drawings.
- C. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and Appendix D in ACI 318, greater than or equal to the design load, as determined by testing per ASTM E 488 conducted by a qualified testing agency.
- D. Power-Actuated Fasteners: Fastener system of type suitable for application, fabricated from corrosion-resistant materials, with capability to sustain, without failure, allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.
- E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.
 1. Head Type: Low-profile head beneath sheathing; manufacturer's standard elsewhere.
- F. Welding Electrodes: Comply with AWS standards.

2.7 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: SSPC-Paint 20 or MIL-P-21035B.

- B. Shims: Load bearing, of high-density multimonomer plastic, nonleaching; or of cold-formed steel of same grade and coating as framing members supported by shims.

2.8 FABRICATION

- A. Fabricate cold-formed steel trusses and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
 - 1. Fabricate trusses using jigs or templates.
 - 2. Cut truss members by sawing or shearing; do not torch cut.
 - 3. Fasten cold-formed steel truss members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator.
 - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - 4. Fasten other materials to cold-formed steel trusses by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.
- B. Reinforce, stiffen, and brace trusses to withstand handling, delivery, and erection stresses. Lift fabricated trusses to prevent damage or permanent distortion.
- C. Fabrication Tolerances: Fabricate assemblies' level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
 - 1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
 - 2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting substrates and abutting cold-formed steel trusses for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.
- B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed steel trusses without reducing thickness of fire-resistive materials below that is required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

3.3 INSTALLATION

- A. Install, bridge, and brace cold-formed steel trusses according to AISI S200, AISI S214, AISI's "Code of Standard Practice for Cold-Formed Steel Structural Framing," and manufacturer's written instructions unless more stringent requirements are indicated.
- B. Install cold-formed steel trusses and accessories plumb, square, and true to line, and with connections securely fastened.
 - 1. Fasten cold-formed steel trusses by welding or mechanical fasteners.
 - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings; comply with requirements for spacing, edge distances, and screw penetration.
- C. Install temporary bracing and supports. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- D. Truss Spacing: As indicated in drawings.
- E. Do not alter, cut, or remove framing members or connections of trusses.
- F. Erect trusses with plane of truss webs plumb and parallel to each other, align, and accurately position at spacings indicated.
- G. Erect trusses without damaging framing members or connections.
- H. Coordinate with wall framing to align webs of bottom chords and load-bearing studs or continuously reinforce track to transfer loads to structure. Anchor trusses securely at all bearing points.

- I. Install continuous bridging and permanently brace trusses as indicated on Shop Drawings and designed according to CFSEI's TechNote 551e, "Design Guide: Permanent Bracing of Cold-Formed Steel Trusses."
- J. Erection Tolerances: Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
 - 1. Space individual trusses no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 FIELD QUALITY CONTROL

- A. Special Inspections: Engage a qualified special inspector to perform the following special inspections:
- B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- C. Field and shop welds will be subject to testing and inspecting.
- D. Prepare test and inspection reports.

3.5 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed metal trusses are without damage or deterioration at time of Substantial Completion.

END OF SECTION 054400

**SECTION 055000
METAL FABRICATIONS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Steel framing and supports for applications where framing and supports are not specified in other Sections.
 - 2. Metal ships' ladders.
- B. Products furnished, but not installed, under this Section include the following:
 - 1. Loose steel lintels.
 - 2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
 - 3. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.
- C. Related Requirements:
 - 1. Section 033000 "Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves, slotted-channel inserts, wedge-type inserts, and other items cast into concrete.
 - 2. Section 051200 "Structural Steel Framing."

1.3 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that

are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.4 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Nonslip aggregates and nonslip-aggregate surface finishes.
 - 2. Metal nosings and treads.
 - 3. Paint products.
- B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:
 - 1. Metal ships' ladders.
 - 2. Loose steel lintels.
- C. Delegated-Design Submittal: For ladders, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For professional engineer.
- B. Mill Certificates: Signed by stainless-steel manufacturers, certifying that products furnished comply with requirements.
- C. Welding certificates.
- D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- E. Research/Evaluation Reports: For post-installed anchors, from ICC-ES.

1.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

1.7 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design ladders.
- B. Structural Performance of Ladders: Ladders shall withstand the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.

2.2 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Stainless-Steel Sheet, Strip, and Plate: ASTM A 240/A 240M or ASTM A 666, Type 304.
- D. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.
- E. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.
- F. Rolled-Stainless-Steel Floor Plate: ASTM A 793.
- G. Abrasive-Surface Floor Plate: Steel plate with abrasive granules rolled into surface or with abrasive material metallurgically bonded to steel.
- H. Steel Tubing: ASTM A 500/A 500M, cold-formed steel tubing.
- I. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.
- J. Zinc-Coated Steel Wire Rope: ASTM A 741.

1. Wire-Rope Fittings: Hot-dip galvanized-steel connectors with capability to sustain, without failure, a load equal to minimum breaking strength of wire rope with which they are used.
- K. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.
 1. Size of Channels: As indicated.
 2. Material: Galvanized steel, ASTM A 653/A 653M, structural steel, Grade 33, with G90 (Z275) coating; 0.108-inch nominal thickness.
 3. Material: Cold-rolled steel, ASTM A 1008/A 1008M, structural steel, Grade 33; 0.0966-inch minimum thickness; hot-dip galvanized after fabrication.
- L. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.
- M. Aluminum Plate and Sheet: ASTM B 209, Alloy 6061-T6.
- N. Aluminum Extrusions: ASTM B 221, Alloy 6063-T6.
- O. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632M, Alloy 6061-T6.
- P. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.
- Q. Bronze Extrusions: ASTM B 455, Alloy UNS No. C38500 (extruded architectural bronze).
- R. Bronze Castings: ASTM B 584, Alloy UNS No. C83600 (lead red brass) or No. C84400 (lead semired brass).
- S. Nickel Silver Extrusions: ASTM B 151/B 151M, Alloy UNS No. C74500.
- T. Nickel Silver Castings: ASTM B 584, Alloy UNS No. C97600 (20 percent lead nickel bronze).

2.3 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
 1. Provide stainless-steel fasteners for fastening aluminum.
 2. Provide stainless-steel fasteners for fastening stainless steel.
 3. Provide stainless-steel fasteners for fastening nickel silver.
 4. Provide bronze fasteners for fastening bronze.

- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.
- C. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 325, Type 3; with hex nuts, ASTM A 563, Grade C3; and, where indicated, flat washers.
- D. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593; with hex nuts, ASTM F 594; and, where indicated, flat washers; Alloy Group 1.
- E. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.
 - 1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- F. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.
- G. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.
- H. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.
 - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
 - 2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.
- I. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches by length indicated with anchor straps or studs not less than 3 inches long at not more than 8 inches o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B 633, Class Fe/Zn 5, as needed for fastening to inserts.

2.4 MISCELLANEOUS MATERIALS

- A. Shop Primers: Provide primers that comply with Section 099113 "Exterior Painting." Section 099123 Interior Painting."

- B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
 - 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- C. Water-Based Primer: Emulsion type, anticorrosive primer for mildly corrosive environments that is resistant to flash rusting when applied to cleaned steel, complying with MPI#107 and compatible with topcoat.
- D. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.
- E. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.
- F. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- G. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
- H. Concrete: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi.

2.5 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.
 3. Remove welding flux immediately.
 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
- J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
1. Fabricate units from slotted channel framing where indicated.
 2. Furnish inserts for units installed after concrete is placed.
- C. Galvanize miscellaneous framing and supports where indicated.
- D. Prime miscellaneous framing and supports with as indicated.

2.7 NOT USED

2.8 NOT USED

2.9 NOT USED

2.10 NOT USED

2.11 NOT USED

2.12 METAL SHIPS' LADDERS

- A. Provide metal ships' ladders where indicated. Fabricate of open-type construction with channel or plate stringers and pipe and tube railings unless otherwise indicated. Provide brackets and fittings for installation.
 - 1. Treads shall be not less than 5 inches (127 mm) exclusive of nosing or less than 8-1/2 inches (216 mm) including the nosing, and riser height shall be not more than 9-1/2 inches (241 mm).
 - 2. Fabricate ships' ladders, including railings from steel.
 - 3. Fabricate treads from welded or pressure-locked steel bar grating. Limit openings in gratings to no more than 1/2 inch (12 mm) in least dimension.
 - 4. Fabricate treads rolled-stainless-steel floor plate
- B. Galvanize and prime exterior steel ships' ladders, including treads, railings, brackets, and fasteners.
- C. Prime exterior steel ships's ladder, including treads, railings, brackets, and fasteners, with zinc-rich primer.

2.13 NOT USED

2.14 NOT USED

2.15 NOT USED

2.16 NOT USED

2.17 NOT USED

2.18 NOT USED

2.19 NOT USED

2.20 NOT USED

2.21 NOT USED

2.22 NOT USED

2.23 NOT USED

2.24 LOOSE STEEL LINTELS

- A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.
- B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span, but not less than 8 inches unless otherwise indicated.
- C. Galvanize loose steel lintels located in exterior walls.

2.25 NOT USED

2.26 NOT USED

2.27 NOT USED

2.28 NOT USED

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

- F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:
 - 1. Cast Aluminum: Heavy coat of bituminous paint.
 - 2. Extruded Aluminum: Two coats of clear lacquer.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
- B. Anchor supports securely to, and rigidly brace from, building structure.
- C. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.
 - 1. Where grout space under bearing plates is indicated for girders supported on concrete or masonry, install as specified in "Installing Bearing and Leveling Plates" Article.
- D. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified in "Installing Bearing and Leveling Plates" Article.
 - 1. Grout baseplates of columns supporting steel girders after girders are installed and leveled.

3.3 NOT USED

3.4 NOT USED

3.5 NOT USED

3.6 NOT USED

3.7 NOT USED

3.8 NOT USED

3.9 NOT USED

3.10 NOT USED

END OF SECTION 055000

**SECTION 06 10 00
ROUGH CARPENTRY**

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. This section specifies wood blocking, framing, sheathing, furring, nailers, sub-flooring, rough hardware, and light wood construction.

1.2 RELATED WORK:

- A. Sustainable design requirements: Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.
- B. Milled woodwork: Section 06 20 00, FINISH CARPENTRY.
- C. Gypsum sheathing: Section 09 29 00, GYPSUM BOARD.
- D. Cement board sheathing: Section 06 16 63, CEMENTITIOUS SHEATHING.

1.3 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Sustainable Design Submittals, as described below:
 - 1. Postconsumer and preconsumer recycled content as specified in PART 2 - PRODUCTS.
 - 2. Volatile organic compounds per volume as specified in PART 2 - PRODUCTS.
 - 3. For composite wood products, submit documentation indicating that product contains no added urea formaldehyde.
- C. Shop Drawings showing framing connection details, fasteners, connections and dimensions.
- D. Manufacturer's Literature and Data:
 - 1. Submit data for lumber, panels, hardware and adhesives.
 - 2. Submit data for wood-preserved treatment from chemical treatment manufacturer and certification from treating plants that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.

3. Submit data for fire retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
4. For products receiving a waterborne treatment, submit statement that moisture content of treated materials was reduced to levels specified before shipment to project site.

E. Manufacturer's certificate for unmarked lumber.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING:

- A. Protect lumber and other products from dampness both during and after delivery at site.
- B. Pile lumber in stacks in such manner as to provide air circulation around surfaces of each piece.
- C. Stack plywood and other board products so as to prevent warping.
- D. Locate stacks on well drained areas, supported at least 152 mm (6 inches) above grade and cover with well-ventilated sheds having firmly constructed over hanging roof with sufficient end wall to protect lumber from driving rain.

1.5 QUALITY ASSURANCE:

- A. Installer: A firm with a minimum of three (3) years' experience in the type of work required by this section.

1.6 GRADING AND MARKINGS:

- A. Any unmarked lumber or plywood panel for its grade and species will not be allowed on VA Construction sites for lumber and material not normally grade marked, provide manufacturer's certificates (approved by an American Lumber Standards approved agency) attesting that lumber and material meet the specified the specified requirements.

1.7 APPLICABLE PUBLICATIONS:

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in the text by basic designation only.

- B. American Forest and Paper Association (AFPA):
- NDS-15National Design Specification for Wood Construction
 - WCD1-01Details for Conventional Wood Frame Construction
- C. American Institute of Timber Construction (AITC):
- A190.1-07Structural Glued Laminated Timber
- D. American Society of Mechanical Engineers (ASME):
- B18.2.1-12(R2013)Square and Hex Bolts and Screws
 - B18.2.2-10Square and Hex Nuts
 - B18.6.1-81(R2008)Wood Screws
- E. American Plywood Association (APA):
- E30-11Engineered Wood Construction Guide
- F. ASTM International (ASTM):
- A653/A653M-13Steel Sheet Zinc-Coated (Galvanized) or Zinc-Iron Alloy
Coated (Galvannealed) by the Hot Dip Process
 - C954-11Steel Drill Screws for the Application of Gypsum Board or
Metal Plaster Bases to Steel Studs from 0.033 inch (2.24
mm) to 0.112-inch (2.84 mm) in thickness
 - C1002-14Steel Self-Piercing Tapping Screws for the Application of
Gypsum Panel Products or Metal Plaster Bases to Wood
Studs or Metal Studs
 - D198-14Test Methods of Static Tests of Lumber in Structural Sizes
 - D2344/D2344M-13Test Method for Short-Beam Strength of Polymer Matrix
Composite Materials and Their Laminates
 - D2559-12aAdhesives for Structural Laminated Wood Products for Use
Under Exterior (Wet Use) Exposure Conditions
 - D3498-03(R2011)Adhesives for Field-Gluing Plywood to Lumber Framing for
Floor Systems
 - D6108-13Test Method for Compressive Properties of Plastic Lumber
and Shapes

D6109-13.....Test Methods for Flexural Properties of Unreinforced and
Reinforced Plastic Lumber and Related Products

D6111-13a.....Test Method for Bulk Density and Specific Gravity of Plastic
Lumber and Shapes by Displacement

D6112-13.....Test Methods for Compressive and Flexural Creep and
Creep-Rupture of Plastic Lumber and Shapes

F844-07a(R2013).....Washers, Steel, Plan (Flat) Unhardened for General Use

F1667-13Nails, Spikes, and Staples

G. American Wood Protection Association (AWPA):

AWPA Book of Standards

H. Commercial Item Description (CID):

A-A-55615Shield, Expansion (Wood Screw and Lag Bolt Self Threading
Anchors)

I. Forest Stewardship Council (FSC):

FSC-STD-01-001(Ver. 4-0)FSC Principles and Criteria for Forest Stewardship

J. Military Specification (Mil. Spec.):

MIL-L-19140ELumber and Plywood, Fire-Retardant Treated

K. Environmental Protection Agency (EPA):

40 CFR 59(2014).....National Volatile Organic Compound Emission Standards
for Consumer and Commercial Products

L. Truss Plate Institute (TPI):

TPI-85Metal Plate Connected Wood Trusses

M. U.S. Department of Commerce Product Standard (PS)

PS 1-95Construction and Industrial Plywood

PS 20-10American Softwood Lumber Standard

N. ICC Evaluation Service (ICC ES):

AC09Quality Control of Wood Shakes and Shingles

AC174.....Deck Board Span Ratings and Guardrail Systems (Guards
and Handrails)

PART 2 - PRODUCTS

2.1 LUMBER:

- A. Unless otherwise specified, each piece of lumber must bear grade mark, stamp, or other identifying marks indicating grades of material, and rules or standards under which produced.
 - 1. Identifying marks are to be in accordance with rule or standard under which material is produced, including requirements for qualifications and authority of the inspection organization, usage of authorized identification, and information included in the identification.
 - 2. Inspection agency for lumber approved by the Board of Review, American Lumber Standards Committee, to grade species used.
- B. Structural Members: Species and grade as listed in the AFPA NDS having design stresses as shown.
- C. Lumber Other Than Structural:
 - 1. Unless otherwise specified, species graded under the grading rules of an inspection agency approved by Board of Review, American Lumber Standards Committee.
 - 2. Framing lumber: Minimum extreme fiber stress in bending of 7584 kPa (1100 PSI).
 - 3. Furring, blocking, nailers and similar items 101 mm (4 inches) and narrower Standard Grade; and, members 152 mm (6 inches) and wider, Number 2 Grade.
 - 4. Board Sub-flooring: Shiplap edge, 25 mm (1 inch) thick, not less than 203 mm (8 inches) wide.
- D. Sizes:
 - 1. Conforming to PS 20.
 - 2. Size references are nominal sizes, unless otherwise specified, actual sizes within manufacturing tolerances allowed by standard under which produced.
- E. Moisture Content:
 - 1. Maximum moisture content of wood products is to be as follows at the time of delivery to site.
 - a. Boards and lumber 50 mm (2 inches) and less in thickness: 19 percent or less.

b. Lumber over 50 mm (2 inches) thick: 25 percent or less.

F. Fire Retardant Treatment:

1. Comply with Mil Spec. MIL-L-19140.
2. Treatment and performance inspection, by an independent and qualified testing agency that establishes performance ratings.

G. Preservative Treatment:

1. Do not treat Heart Redwood and Western Red Cedar.
2. Treat wood members and plywood exposed to weather or in contact with plaster, masonry or concrete, including framing of open roofed structures; sills, sole plates, furring, and sleepers that are less than 610 mm (24 inches) from ground; nailers, edge strips, blocking, crickets, curbs, cant, vent strips and other members provided in connection with roofing and flashing materials.
3. Treat other members specified as preservative treated (PT).
4. Preservative treat by the pressure method complying with AWPA Book use category system standards U1 and T1, except any process involving the use of Chromated Copper Arsenate (CCA) or other agents classified as carcinogenic for pressure treating wood is not permitted.

2.2 PLASTIC LUMBER:

A. General:

1. Allowable loads and spans, as documented in evaluation reports or in information referenced in evaluation reports, are not to be less than design loads and spans indicated on contract documents.
2. Restricted to exterior use only.

B. Composite Plastic Lumber: Shapes made from a mixture of cellulose fiber and polyethylene or polypropylene.

1. Provide lumber with a minimum of 75 percent recycled content with a minimum of 25 percent post-consumer recycled content.
2. Decking Standard: ICC-ES AC109

3. Shear Parallel to Length: Maximum 6894 kPa (1,000 psi) in accordance with ASTM D2344/D2344M.
 4. Density: ASTM D6111.
 5. Compressive Strength:
 - a. Secant Modulus: Minimum 482,633 kPa (70,000 psi) in accordance with ASTM D6108.
 - b. Stress at 3 percent strain: Minimum 10,342 kPa (1,500 psi) in accordance with ASTM D6108.
 - c. Compression Parallel to Grain: Minimum 20,684 kPa (3,000 psi) in accordance with ASTM D6112.
 - d. Compression Perpendicular to Grain: Minimum 6,894 kPa (1,000 psi) in accordance with ASTM D6112.
 6. Flexural Strength: Minimum 13,789 kPa (2,000 psi) in accordance with ASTM D6109.
 7. Tensile Strength: Minimum 8618 kPa (1,250 psi) in accordance with ASTM D198.
 8. Surface Texture: Smooth .
 9. Color: As indicated in Section 09 06 00, SCHEDULE FOR FINISHES.
- C. All-Plastic Lumber: Shapes made from high-density polyethylene (HDPE), PVC, polystyrene, or cellular PVC with no cellulose fiber.
1. Provide lumber with a minimum of 75 percent recycled content with a minimum of 25 percent of post-consumer recycled content.
 2. Decking Standard: ICC-ES AC174.
 3. Shear Parallel to Length: Maximum 6,894 kPa (1,000 psi) in accordance with ASTM D2344/D2344M.
 4. Density: ASTM D6111.
 5. Compressive Strength:
 - a. Secant Modulus: Minimum 482,633 kPa (70,000 psi) in accordance with ASTM D6108.
 - b. Stress at 3 percent strain: Minimum 10,342 kPa (1,500 psi) in accordance with ASTM D6108.

- c. Compression Parallel to Grain: Minimum 20,684 kPa (3,000 psi) in accordance with ASTM D6112.
- d. Compression Perpendicular to Grain: Minimum 6,894 kPa (1,000 psi) in accordance with ASTM D6112.
- 6. Flexural Strength: Minimum 13,789 kPa (2,000 psi) in accordance with ASTM D6109.
- 7. Tensile Strength: Minimum 8618 kPa (1,250 psi) in accordance with ASTM D198.
- 8. Surface Texture: Smooth.
- 9. Color: As indicated in Section 09 06 00, SCHEDULE FOR FINISHES.

2.3 PLYWOOD:

- A. Comply with PS 1.
- B. Bear the mark of a recognized association or independent inspection agency that maintains continuing control over quality of plywood which identifies compliance by veneer grade, group number, span rating where applicable, and glue type.
- C. Sheathing:
 - 1. APA rated Exposure 1 or Exterior; panel grade CD or better.
 - 2. Wall sheathing:
 - a. Minimum 9 mm (11/32 inch) thick with supports 406 mm (16 inches) on center and 12 mm (15/32 inch) thick with supports 610 mm (24 inches) on center unless specified otherwise.
 - b. Minimum 1200 mm (48 inches) wide at corners without corner bracing of framing.
 - 3. Roof sheathing:
 - a. Minimum 9 mm (11/32 inch) thick with span rating 24/0 or 12 mm (15/32 inch) thick with span rating for supports 406 mm (16 inches) on center unless specified otherwise.
 - b. Minimum 15 mm (19/32 inch) thick or span rating of 40/20 or 18 mm (23/32 inch) thick or span rating of 48/24 for supports 610 mm (24 inches) on center.
- D. Subflooring:

1. Under finish wood flooring or underlayment:
 - a. APA Rated sheathing, Exposure 1. panel grade CD.
 - b. Minimum 15 mm (19/32 inch) thick with span rating 32/16 or greater for supports at 406 mm (16 inches) on center and 18.25 mm (23/32 inch) thick with span rating 48/24 for supports at 610 mm (24 inches) on center.
 2. Combination subflooring-underlayment under resilient flooring or carpet:
 - a. APA Rated Stud-I-Floor Exterior or Exposure 1, T and G.
 - b. Minimum 15 mm (19/32 inch) thick or greater, span rating 16, for supports at 406 mm (16 inches) on center; 18 mm (23/32 inch) thick or greater, span rating 24, for supports at 610 mm (24 inches) on center.
 - c. Minimum 19 mm (3/4-inch) thick or greater, span rating 32, for supports at 812 mm (32 inches) on center; 28 mm (1-1/8 inch) thick, span rating 48 for supports at 1219 mm (48 inches) on center.
- E. Underlayment:
1. APA rated Exposure 1 or Exterior, panel grade C-C Plugged.
 2. Minimum 6 mm (1/4 inch) thick or greater over plywood subflooring and 9 mm (3/8 inch) thick or greater over board subflooring, unless otherwise shown.

2.4 STRUCTURAL-USE PANELS:

- A. Comply with APA E30.
- B. Bearing the mark of a recognized association or independent agency that maintains continuing control over quality of panel which identifies compliance by end use, Span Rating, and exposure durability classification.
- C. Wall and Roof Sheathing:
 1. APA Rated sheathing panels, durability classification of Exposure 1 or Exterior Span Rating of 16/0 or greater for supports 406 mm (16 inches) on center and 24/0 or greater for supports 610 mm (24 inches) on center.
- D. Subflooring:
 1. Under finish wood flooring or underlayment:
 - a. APA rated sheathing panels, durability classification of Exposure 1 or Exterior.

- b. Span Rating of 24/16 or greater for supports 406 mm (16 inches).
- 2. Under resilient floor or carpet.
 - a. APA rated combination subfloor-underlayment grade panels, durability classification of Exposure 1 or Exterior T and G.
 - b. Span Rating of 16 or greater for supports 406 mm (16 inches) on center and 24 or greater for supports 610 mm (24 inches) on center.
- E. Underlayment:
 - 1. APA rated Exposure I.
 - 2. Minimum 6 mm (1/4 inch) thick or greater over subfloor.
- F. Wood "I" Beam Members:
 - 1. Size and Shape as indicated in contract documents.
 - 2. Cambered and marked "TOP UP".
 - 3. Plywood webs: PS-1, minimum 9 mm (3/8 inch) thick, unless shown otherwise.
 - 4. Flanges: Kiln dried stress rated dense lumber minimum 38 mm (1-1/2 inch) thick, width as indicated on contract documents.
 - 5. Plywood web fitted into flanges and joined with ASTM D2559 adhesive to form "I" beam section unless shown otherwise.
- G. Laminated Veneer Lumber (LVL):
 - 1. Bonded jointed wood veneers with ASTM D2559 adhesive.
 - 2. Scarf jointed wood veneers with grain of wood parallel.
 - 3. Size as indicated on contract documents.

2.5 ROUGH HARDWARE AND ADHESIVES:

- A. Anchor Bolts:
 - 1. ASME B18.2.1 and ASME B18.2.2 galvanized, 13 mm (1/2 inch) unless shown otherwise.
 - 2. Extend at least 203 mm (8 inches) into masonry or concrete with ends bent 50 mm (2 inches).

- B. Miscellaneous Bolts: Expansion Bolts: C1D A-A-55615; lag bolt, long enough to extend at least 65 mm (2-1/2 inches) into masonry or concrete. Provide 13 mm (1/2 inch) bolt unless shown otherwise.
- C. Washers
 - 1. ASTM F844.
 - 2. Provide zinc or cadmium coated steel or cast iron for washers exposed to weather.
- D. Screws:
 - 1. Wood to Wood: ASME B18.6.1 or ASTM C1002.
 - 2. Wood to Steel: ASTM C954, or ASTM C1002.
- E. Nails:
 - 1. Size and type best suited for purpose unless noted otherwise. Provide aluminum-alloy nails, plated nails, or zinc-coated nails, for nailing wood work exposed to weather and on roof blocking.
 - 2. ASTM F1667:
 - a. Common: Type I, Style 10.
 - b. Concrete: Type I, Style 11.
 - c. Barbed: Type I, Style 26.
 - d. Underlayment: Type I, Style 25.
 - e. Masonry: Type I, Style 27.
 - f. Provide special nails designed for use with ties, strap anchors, framing connectors, joists hangers, and similar items. Nails not less than 32 mm (1-1/4 inches) long, 8d and deformed or annular ring shank.
- F. Framing and Timber Connectors:
 - 1. Fabricate of ASTM A653/A653M, Grade A; steel sheet not less than 1.3 mm (0.052 inch) thick unless specified otherwise. Apply standard plating to steel timber connectors after punching, forming and assembly of parts.
 - 2. Framing Angles: Angle designed with bendable legs to provide three (3) way anchors.
 - 3. Straps:

- a. Designed to provide wind and seismic ties with sizes as shown or specified.
 - b. Strap ties not less than 32 mm (1-1/4 inches) wide.
 - c. Punched for fastener.
5. Joist Hangers:
- a. Fabricated of 1.6 mm (0.063 inch) minimum thick sheet, U design unless shown otherwise.
 - b. Heavy duty hangers fabricated of minimum 2.7 mm (0.108 inch) thick sheet, U design with bent top flange to lap over beam.
6. Timber Connectors: Fabricated of steel to shapes indicated on contract drawings.
7. Joist Ties: Mild steel flats, 5 mm by 32 mm (3/16 inch by 1-1/4 inch) size with ends bent about 30 degrees from horizontal, and extending at least 406 mm (16 inches) onto framing. Punch each end for three (3) spikes.
8. Wall Anchors for Joists and Rafters:
- a. Mild steel strap, 5 mm by 32 mm (3/16 inch by 1-1/4 inch) with wall ends bent 50 mm (2 inches), or provide 9 mm by 130 mm (3/8 inch by 5 inch) pin through strap end built into masonry.
 - b. Strap long enough to extend onto three joists or rafters, and punched for spiking at each bearing.
 - c. Strap not less than 101 mm (4 inches) embedded end.
9. Joint Plates:
- a. Steel plate punched for nails.
 - b. Steel plates formed with teeth or prongs for mechanically clamping plates to wood.
 - c. Size for axial eccentricity, and fastener loads.
- G. Adhesives:
- 1. For field-gluing plywood to lumber framing floor or roof systems: ASTM D3498.
 - 2. For structural laminated Wood: ASTM D2559.
 - 3. Adhesives to have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, (EPA Method 24).

PART 3 - EXECUTION

3.1 INSTALLATION OF FRAMING AND MISCELLANEOUS WOOD MEMBERS:

- A. Conform to applicable requirements of the following:
 - 1. AFPA NDS for timber connectors.
 - 2. AITC A190.1 Timber Construction Manual for heavy timber construction.
 - 3. AFPA WCD1 for nailing and framing unless specified otherwise.
 - 4. APA for installation of plywood or structural use panels.
 - 5. TPI for metal plate connected wood trusses.
 - 6. Space plastic lumber boards to allow for lengthwise expansion and contraction in accordance with manufacturer recommendations.
- B. Fasteners:
 - 1. Nails.
 - a. Nail in accordance with the Recommended Nailing Schedule as specified in AFPA WCD1 where detailed nailing requirements are not specified in nailing schedule. Select nail size and nail spacing sufficient to develop adequate strength for the connection without splitting the members.
 - b. Use special nails with framing connectors.
 - c. For sheathing and subflooring, select length of nails sufficient to extend 25 mm (1 inch) into supports.
 - d. Use 8d or larger nails for nailing through 25 mm (1 inch) thick lumber and for toe nailing 50 mm (2 inch) thick lumber.
 - e. Use 16d or larger nails for nailing through 50 mm (2 inch) thick lumber.
 - f. Select the size and number of nails in accordance with the Nailing Schedule except for special nails with framing anchors.
 - g. Nailing Schedule; Using Common Nails:
 - 1) Joist bearing on sill or girder, toe nail three (3) 8d nails or framing anchor.
 - 2) Bridging to joist, toe nail each end two (2) 8d nails.
 - 3) Ledger strip to beam or girder three (3) 16d nails under each joint.
 - 4) Subflooring or Sheathing:

- a) 152 mm (6 inch) wide or less to each joist face nail two (2) 8d nails.
 - b) Subflooring, more than 152 mm (6 inches) wide, to each stud or joint, face nail three (3) 8d nails.
 - c) Plywood or structural use panel to each stud or joist face nail 8d, at supported edges 152 mm (6 inches) on center and at intermediate supports 254 mm (10 inches) on center. When gluing plywood to joint framing increase nail spacing to 305 mm (12 inches) at supported edges and 508 mm (20 inches) o.c. at intermediate supports.
- 5) Sole plate to joist or blocking, through sub floor face nail 20d nails, 406 mm (16 inches) on center.
 - 6) Top plate to stud, end nail two (2) 16d nails.
 - 7) Stud to sole plate, toe nail or framing anchor. Four (4) 8d nails.
 - 8) Doubled studs, face nail 16d at 610 mm (24 inches) on center.
 - 9) Built-up corner studs 16d at 610 mm (24 inches) (24 inches) on center.
 - 10) Doubled top plates, face nails 16d at 406 mm (16 inches) on center.
 - 11) Top plates, laps, and intersections, face nail two (2) 16d.
 - 12) Continuous header, two pieces 16d at 406 mm (16 inches) on center along each edge.
 - 13) Ceiling joists to plate, toenail three (3) 8d or framing anchor.
 - 14) Continuous header to stud, four (4) 16d.
 - 15) Ceiling joists, laps over partitions, face nail three (3) 16d or framing anchor.
 - 16) Ceiling joists, to parallel rafters, face nail three (3) 16d.
 - 17) Rafter to plate, toe nail three (3) 8d or framing anchor. Brace 25 mm (1 inch) thick board to each stud and plate, face nail three (3) 8d.
 - 18) Built-up girders and beams 20d at 812 mm (32 inches) on center along each edge.
2. Bolts:
- a. Fit bolt heads and nuts bearing on wood with washers.
 - b. Countersink bolt heads flush with the surface of nailers.

- c. Embed in concrete and solid masonry or provide expansion bolts. Special bolts or screws designed for anchor to solid masonry or concrete in drilled holes may be used.
 - d. Provide toggle bolts to hollow masonry or sheet metal.
 - e. Provide bolts to steel over 2.84 mm (0.112 inch, 11 gage) in thickness. Secure wood nailers to vertical structural steel members with bolts, placed one at ends of nailer and 610 mm (24 inch) intervals between end bolts. Provide clips to beam flanges.
- 3. Drill Screws to steel less than 2.84 mm (0.112 inch) thick.
 - a. ASTM C1002 for steel less than 0.84 mm (0.033 inch) thick.
 - b. ASTM C954 for steel over 0.84 mm (0.033 inch) thick.
- 4. Power actuated drive pins may be provided where practical to anchor to solid masonry, concrete, or steel.
- 5. Do not anchor to wood plugs or nailing blocks in masonry or concrete. Provide metal plugs, inserts or similar fastening.
- 6. Screws to Join Wood:
 - a. Where shown or option to nails.
 - b. ASTM C1002, sized to provide not less than 25 mm (1 inch) penetration into anchorage member.
 - c. Spaced same as nails.
- 7. Installation of Timber Connectors:
 - a. Conform to applicable requirements of the AFPA NDS.
 - b. Fit wood to connectors and drill holes for fasteners so wood is not split.
- 8. Install plastic lumber with stainless steel bolts or screws; if nails are used use stainless steel spiral shank or ring shank type.
- C. Set sills or plates level in full bed of mortar on masonry or concrete walls.
 - 1. Space anchor bolts 1219 mm (4 feet) on centers between ends and within 152 mm (6 inches) of end. Stagger bolts from side to side on plates over 178 mm (7 inches) in width.

2. Provide shims of slate, tile or similar approved material to level wood members resting on concrete or masonry. Do not use wood shims or wedges.
3. Closely fit, and set to required lines.
- D. Cut notch, or bore in accordance with AFPA WCD1 passage of ducts wires, bolts, pipes, conduits and to accommodate other work. Repair or replace miscut, misfit or damaged work.
- E. Blocking Nailers, and Furring:
 1. Install furring, blocking, nailers, and grounds where shown.
 2. Provide longest lengths practicable.
 3. Provide fire retardant treated wood blocking where shown at openings and where shown or specified.
 4. Layers of Blocking or Plates:
 - a. Stagger end joints between upper and lower pieces.
 - b. Nail at ends and not over 610 mm (24 inches) between ends.
 - c. Stagger nails from side to side of wood member over 127 mm (5 inches) in width.
- F. Floor and Ceiling Framing:
 1. Set with crown edge up.
 2. Keep framing at least 50 mm (2 inches) away from chimneys.
 3. Bear on not less than 101 mm (4 inches) on concrete and masonry, and 38 mm (1-1/2 inches) on wood and metal unless shown otherwise.
 4. Support joist, trimmer joists, headers, and beams framing into carrying members at same relative levels on joist hangers unless shown otherwise.
 5. Lap and spike wood joists together at bearing, or butt end-to-end with scab ties at joint and spike to plates. Scab tie lengths not less than 203 mm (8 inches) lap on joist ends. Install wood I beam joists as indicated in contract documents.
 6. Frame openings with headers and trimmer joist. Double headers carrying more than two tail joists and trimmer joists supporting headers carrying more than one tail joist unless otherwise indicated in contract documents.

7. Drive nails through headers into joists using two (2) nails for 50 mm by 152 mm (2 inch by 6 inch); three (3) nails for 50 mm by 203 mm (2 inch by 8 inch) and four (4) nails for 50 mm by 254 mm (2 inch by 10 inch) and over in size.
 8. Install nearest joist to double headers and spike joist to both header members before trimmer joist is installed and secured together.
 9. Doubled joists under partitions parallel with floor joists. Fire cut joists built into masonry or concrete.
 10. Where joists run perpendicular to masonry or concrete, anchor every third joist to masonry or concrete with one (1) metal wall anchor. Securely spike anchors with three (3) nails to side of joist near its bottom.
 11. Anchor joists running parallel with masonry or concrete walls to walls with steel flats spaced not over 1828 mm (6 feet) apart. Extend steel flats over at least three (3) joists and into masonry 101 mm (4 inches) with ends turned 50 mm (2 inches); bolt to concrete. Set top of flats flush with top of joists, and securely nail steel flats to each joist.
 12. Hook ties at steel framing over top flange of steel members.
 13. Nonbearing partitions running parallel with ceiling joists, install solid 50 mm (2 inch) thick bridging same depth as ceiling joists cut to fit snug between joists for securing top plate of partitions. Securely spike bridging to joists. Space 1219 mm (4 feet) on center.
- H. Roof Framing:
1. Set rafters with crown edge up.
 2. Form a true plane at tops of rafters.
 3. Valley, Ridge, and Hip Members:
 - a. Size for depth of cut on rafters.
 - b. Straight and true intersections of roof planes.
 - c. Secure hip and valley rafters to wall plates by using framing connectors.
 - d. Double valley rafters longer than the available lumber, with pieces lapped not less than 1219 mm (4 feet) and spiked together.

- e. Butt joint and scab hip rafters longer than the available lumber.
- 4. Spike to wall plate and to ceiling joists except when secured with framing connectors.
- 5. Frame openings in roof with headers and trimmer rafters. Double headers carrying more than one (1) rafter unless shown otherwise.
- 6. Install 50 mm by 101 mm (2 inch by 4 inch) strut between roof rafters and ceiling joists at 1219 mm (4 feet) on center unless shown otherwise.
- I. Framing of Dormers:
 - 1. Frame as indicated in contract documents, with top edge of ridge beveled to pitch of roof header.
 - 2. Set studs on doubled trimmer rafters.
 - 3. Double studs at corners of dormers.
 - 4. Double plate on studs and notch rafters over plate and bear at least 75 mm (3 inches) on plates.
 - 5. Frame opening to receive window frame or louver frame.
- J. Partition and Wall Framing:
 - 1. Provide 50 mm by 101 mm (2 inch by 4 inch) studs spaced 406 mm (16 inches) on centers; unless otherwise indicated on contract documents.
 - 2. Install double studs at openings and triple studs at corners.
 - 3. Installation of sole plate:
 - a. Anchor plates of walls or partitions resting on concrete floors in place with expansion bolts, one (1) near ends of piece and at intermediate intervals of not more than 1219 mm (4 feet) or with power actuated drive pins with threaded ends of suitable type and size, spaced 610 mm (2 feet) on center unless shown otherwise.
 - b. Nail plates to wood framing through subfloor as specified in nailing schedule.
 - 4. Headers or Lintels:

- a. Make headers for openings of two (2) pieces of 50 mm (2 inch) thick lumber of size shown with plywood filler to finish flush with face of studs or solid lumber of equivalent size.
 - b. Support ends of headers on top of stud cut for height of opening. Spike cut stud to adjacent stud. Spike adjacent stud to header.
 5. Provide double top plates, with members lapped at least 610 mm (2-feet) spiked together.
 6. Install intermediate cut studs over headers and under sills to maintain uniformity of stud spacing.
 7. Provide single sill plates at bottom of opening unless otherwise indicated in contract documents. Toe nail to end stud, face nail to intermediate studs.
 8. Install 50 mm (2 inch) blocking for firestopping so that maximum dimension of any concealed space is not over 2438 mm (8 feet) in accordance with AFPA WCD1.
 9. Install corner bracing when plywood or structured use panel sheathing is not used.
 - a. Let corner bracing into exterior surfaces of studs at an angle of approximately 45 degrees, extended completely over walls plates, and secured at bearing with two (2) nails.
 - b. Provide 25 mm by 101 mm (1 inch by 4 inch) corner bracing.
- K. Rough Bucks:
1. Install rough wood bucks at opening in masonry or concrete where wood frames or trim occur.
 2. Brace and maintain bucks plumb and true until masonry has been built around them or concrete cast in place.
 3. Cut rough bucks from 50 mm (2 inch) thick stock, of same width as partitions in which they occur and of width shown in exterior walls.
 4. Extend bucks full height of openings and across head of openings; fasten securely with anchors specified.
- L. Subflooring:

1. Subflooring may be either boards, structural-use panels, or plywood.
2. Lay board subflooring diagonally, with close joints. Stagger end joints and make joints over supports. Bear each board on at least three supports.
3. Provide a clearance of approximately 13 mm (1/2 inch) at masonry or concrete at walls.
4. Apply plywood and structural-use panel subflooring with face grain or long dimension at right angles to the supports, with edges 6 mm (1/4 inch) apart at side joints, and 3 mm (1/8 inch) apart at end joints.
5. Combination subfloor-underlayment:
 - a. Space edges 3 mm (1/8 inch) apart.
 - b. Provide a clearance of 6 mm (1/4 inch) at masonry on concrete at walls.
6. Stagger panel end joints and make over support.

M. Underlayment:

1. Where finish flooring of different thickness is used in adjoining areas, provide underlayment of thickness required to bring finish-flooring surfaces into same plane.
2. Apply to dry, level, securely nailed, clean, wood subfloor without any projections.
3. Plywood and particle underlayment are to be glue-nailed to subfloor.
4. Butt underlayment panels to a light contact with a 1 mm (1/32 inch) space between plywood or hardboard underlayment panels and walls, and approximately 9 mm (3/8 inch) between particleboard underlayment panels and walls.
5. Stagger underlayment panel end joints with respect to each other and offset joints with respect to joints in the subfloor at least 50 mm (2 inches).
6. After installation, avoid traffic on underlayment and damage to the finish surface.

N. Sheathing:

1. Provide plywood or structural-use panels for sheathing.
2. Lay panels with joints staggered, with edge and ends 3 mm (1/8 inch) apart and nailed over bearings as specified.
3. Set nails not less than 9 mm (3/8 inch) from edges.

4. Install 50 mm by 101 mm (2 inch by 4 inch) blocking spiked between joists, rafters and studs to support edge or end joints of panels.
5. Match and align sheathing which is an extension of work in place to existing.

--- E N D ---

**SECTION 061600
SHEATHING**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Wall sheathing.
 - 2. Roof sheathing.
 - 3. Parapet sheathing.
 - 4. Composite nail base insulated roof sheathing.
 - 5. Subflooring.
 - 6. Underlayment.
 - 7. Sheathing joint and penetration treatment.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
 - 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Include physical properties of treated materials.
 - 3. For fire-retardant treatments, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5516.
 - 4. For products receiving waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.4 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For the following, from ICC-ES:
 - 1. Wood-preservative-treated plywood.
 - 2. Fire-retardant-treated plywood.
 - 3. Foam-plastic sheathing.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance Ratings: As tested according to ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 WOOD PANEL PRODUCTS

- A. Emissions: Products shall meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- B. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.
- C. Factory mark panels to indicate compliance with applicable standard.

2.3 NOT USED

2.4 FIRE-RETARDANT-TREATED PLYWOOD

- A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- B. Fire-Retardant-Treated Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
 - 1. Use treatment that does not promote corrosion of metal fasteners.
 - 2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
 - 3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201/D 3201M at 92 percent relative humidity. Use where exterior type is not indicated.
 - 4. Design Value Adjustment Factors: Treated lumber plywood shall be tested according to ASTM D 5516 and design value adjustment factors shall be calculated according to ASTM D 6305. Span ratings after treatment shall be not less than span ratings specified. For roof sheathing and where high-temperature fire-retardant treatment is indicated, span ratings for temperatures up to 170 deg F shall be not less than span ratings specified.
- C. Kiln-dry material after treatment to a maximum moisture content of 15 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- D. Identify fire-retardant-treated plywood with appropriate classification marking of qualified testing agency.
- E. Application: Treat plywood indicated on Drawings

2.5 WALL SHEATHING

- A. Plywood Sheathing: as indicated in structural drawings.
 - 1. Span Rating: Not less than 24/0.

2. Nominal Thickness: as indicated in drawings.
- B. NOT USED.
- C. NOT USED.
- D. NOT USED.
- E. NOT USED.
- F. NOT USED.
- G. NOT USED.
- H. NOT USED.
- I. NOT USED.

2.6 ROOF SHEATHING

- A. Plywood Sheathing: as indicated in drawings.
 1. Span Rating: Not less than 24/0.
 2. Nominal Thickness: as indicated in drawings.
- B. NOT USED.

2.7 PARAPET SHEATHING

- A. Plywood Sheathing: as indicated in drawings.
 1. Span Rating: 24/0.
 2. Nominal Thickness: as indicated in drawings.
- B. NOT USED.
- C. NOT USED.
- D. NOT USED.

2.8 NOT USED

2.9 NOT USED

2.10 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 - 1. For roof, parapet and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
 - 2. For [roof, parapet and wall sheathing, provide fasteners with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- D. Screws for Fastening Sheathing to Wood Framing: ASTM C 1002.
- E. Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.
- F. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached.
 - 1. For steel framing less than 0.0329 inch thick, use screws that comply with ASTM C 1002.
 - 2. For steel framing from 0.033 to 0.112 inch thick, use screws that comply with ASTM C 954.
- G. Screws for Fastening Composite Nail Base Insulated Roof Sheathing to Metal Roof Deck: Steel drill screws, in type and length recommended by sheathing manufacturer for thickness of sheathing to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117. Provide washers or plates if recommended by sheathing manufacturer.

2.11 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

- A. Sealant for Paper-Surfaced Gypsum Sheathing: Elastomeric, medium-modulus, neutral-curing silicone joint sealant compatible with joint substrates formed by gypsum sheathing and other materials, recommended by sheathing manufacturer for application indicated and complying with requirements for elastomeric sealants specified in Section 079200 "Joint Sealants."
- B. Sealant for Glass-Mat Gypsum Sheathing: Silicone emulsion sealant complying with ASTM C 834, compatible with sheathing tape and sheathing and recommended by tape and sheathing manufacturers for use with glass-fiber sheathing tape and for covering exposed fasteners.
 - 1. Sheathing Tape: Self-adhering glass-fiber tape, minimum 2 inches wide, 10 by 10 or 10 by 20 threads/inch, of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing and with a history of successful in-service use.
- C. Sheathing Tape for Foam-Plastic Sheathing: Pressure-sensitive plastic tape recommended by sheathing manufacturer for sealing joints and penetrations in sheathing.

2.12 NOT USED

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
 - 1. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.
 - 2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in the ICC's International Residential Code for One- and Two-Family Dwellings.
 - 3. ICC-ES evaluation report for fastener.

- D. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.
- E. Coordinate roof, parapet and wall sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

- A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.
- B. Fastening Methods: Fasten panels as indicated below:
 - 1. NOT USED
 - 2. NOT USED
 - 3. Wall and Roof Sheathing: as indicated in drawings.
 - 4. NOT USED

3.3 GYPSUM SHEATHING INSTALLATION

- A. Comply with GA-253 and with manufacturer's written instructions.
 - 1. Fasten gypsum sheathing to wood framing with nails or screws.
 - 2. Fasten gypsum sheathing to cold-formed metal framing with screws.
 - 3. Install panels with a 3/8-inch gap where non-load-bearing construction abuts structural elements.
 - 4. Install panels with a 1/4-inch gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.

- B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.
- C. Horizontal Installation: Install sheathing with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent panels without forcing. Abut ends over centers of studs, and stagger end joints of adjacent panels not less than one stud spacing. Attach at perimeter and within field of panel to each stud.
 - 1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of panels.
 - 2. For sheathing under stucco cladding, panels may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.
- D. Vertical Installation: Install vertical edges centered over studs. Abut ends and edges with those of adjacent panels. Attach at perimeter and within field of panel to each stud.
 - 1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of panels.
 - 2. For sheathing under stucco cladding, panels may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.
- E. Seal sheathing joints according to sheathing manufacturer's written instructions.
 - 1. Apply elastomeric sealant to joints and fasteners and trowel flat. Apply sufficient amount of sealant to completely cover joints and fasteners after troweling. Seal other penetrations and openings.
 - 2. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing joints and apply and trowel sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

3.4 CEMENTITIOUS BACKER UNIT INSTALLATION

- A. Install panels and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated.

3.5 FIBERBOARD SHEATHING INSTALLATION

- A. Comply with ASTM C 846 and with manufacturer's written instructions.

- B. Fasten fiberboard sheathing panels to intermediate supports and then at edges and ends. Use galvanized roofing nails or galvanized staples; comply with manufacturer's recommended spacing and referenced fastening schedule. Drive fasteners flush with surface of sheathing and locate perimeter fasteners at least 3/8 inch from edges and ends.
- C. Install sheathing vertically with long edges parallel to, and centered over, studs. Install solid wood blocking where end joints do not occur over framing. Allow 1/8-inch open space between edges and ends of adjacent units. Stagger horizontal joints if any.
- D. Cover sheathing as soon as practical after installation to prevent deterioration from wetting.

3.6 FOAM-PLASTIC SHEATHING INSTALLATION

- A. Comply with manufacturer's written instructions.
- B. Foam-Plastic Wall Sheathing: Install vapor-relief strips or equivalent for permitting escape of moisture vapor that otherwise would be trapped in stud cavity behind sheathing.
- C. Apply sheathing tape to joints between foam-plastic sheathing panels and at items penetrating sheathing. Apply at upstanding flashing to overlap both flashing and sheathing.

3.7 NOT USED

3.8 NOT USED

END OF SECTION 061600

**SECTION 06 20 00
FINISH CARPENTRY**

PART 1 - GENERAL

1.1 SUMMARY

- A. Items specified:
 - 1. Seats and benches.
 - 2. Counter Shelf.
 - 3. Counter or Work Tops.
 - 4. Pegboard (Perforated Hardboard).
 - 5. Mounting Strips, Shelves, and Rods.

1.2 RELATED REQUIREMENTS

- A. Adhesive, Paint, and Finish VOC Limits: Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.
- B. Woodwork Finish and Color: Section 09 06 00, SCHEDULE FOR FINISHES.
- C. Fabricated Metal brackets, bench supports and countertop legs: Section 05 50 00, METAL FABRICATIONS.
- D. Framing, furring and blocking: Section 06 10 00, ROUGH CARPENTRY.
- E. Wood doors: Section 08 14 00, WOOD DOORS.
- F. Color and texture of finish: Section 09 06 00, SCHEDULE FOR FINISHES.
- G. Stock Casework: Section 12 32 00, MANUFACTURED WOOD CASEWORK.
- H. Other Countertops: Division 11, EQUIPMENT and Division 12, FURNISHINGS.
- I. Electrical light fixtures and duplex outlets: Division 26, ELECTRICAL.

1.3 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. ASTM International:
 - 1. A36/A36M-14 - Carbon Structural Steel.
 - 2. A53/A53M-12 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.

3. A240/A240M-15b - Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
4. B26/B26M-14e1 - Aluminum-Alloy Sand Castings.
5. B221-14 - Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
6. E84-15b - Surface Burning Characteristics of Building Materials.
- C. American Hardboard Association (AHA):
 1. A135.4-04 - Basic Hardboard.
- D. Architectural Woodwork Institute (AWI):
 1. AWI-09 - Architectural Woodwork Quality Standards and Quality Certification Program.
- E. Builders Hardware Manufacturers Association (BHMA):
 1. A156.9-10 - Cabinet Hardware.
 2. A156.11-14 - Cabinet Locks.
 3. A156.16-13 - Auxiliary Hardware.
- F. Federal Specifications (Fed. Spec.):
 1. A-A-1922A - Shield Expansion (Calking Anchors, Single Lead).
 2. A-A-1936A - Adhesive, Contact, Neoprene Rubber.
 3. FF-N-836E- Nut: Square, Hexagon, Cap, Slotted, Castle, Knurled, Welding.
 4. FF-S-111D(1) - Screw, Wood (Notice 1 inactive for new design).
 5. MM-L-736C(1) - Lumber, Hardwood.
- G. Hardwood Plywood and Veneer Association (HPVA):
 1. HP1-09 - Hardwood and Decorative Plywood.
- H. Military Specification (Mil. Spec):
 1. MIL-L-19140E - Lumber and Plywood, Fire-Retardant Treated.
- I. National Particleboard Association (NPA):
 1. A208.1-09 - Wood Particleboard.
- J. National Electrical Manufacturers Association (NEMA):

1. LD 3-05 - High-Pressure Decorative Laminates.
- K. U.S. Department of Commerce, Product Standard (PS):
 1. PS1-07 - Construction and Industrial Plywood.
 2. PS20-10 - American Softwood Lumber Standard.

1.4 PREINSTALLATION MEETINGS

- A. Conduct preinstallation meeting at project site minimum 30 days before beginning Work of this section.
 1. Required Participants:
 - a. Contracting Officer's Representative.
 - b. Architect/Engineer.
 - c. VA Interior Designer.
 - d. Contractor.
 - e. Installer.
 2. Meeting Agenda: Distribute agenda to participants minimum 3 days before meeting.
 - a. Installation schedule.
 - b. Installation sequence.
 - c. Preparatory work.
 - d. Protection before, during, and after installation.
 - e. Installation.
 - f. Terminations.
 - g. Transitions and connections to other work.
 - h. Other items affecting successful completion.
 3. Document and distribute meeting minutes to participants to record decisions affecting installation.

1.5 SUBMITTALS

- A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Submittal Drawings:

1. Show size, configuration, and fabrication and installation details.
2. Millwork items - Half full size scale for sections and details 1: 50 (1/4 inch for elevations and plans.

C. Manufacturer's Literature and Data:

1. Description of each product.
 - a. Finish hardware.
 - b. Sinks with fittings.
 - c. Electrical components.
2. List of acceptable sealers for fire retardant materials.
3. Installation instructions.

D. Samples:

1. Plastic Laminate Finished Plywood and Particleboard: 6 by 12 inches long, each type and color.
 - a. Submit quantity required to show full color and texture range.
2. Approved samples may be incorporated into work.

E. Sustainable Construction Submittals:

1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.
2. Low Pollutant-Emitting Materials:
 - a. Show volatile organic compound types and quantities.
 - b. Certify each composite wood and agrifiber product contains no added urea formaldehyde.

F. Certificates: Certify products comply with specifications.

1. Fire retardant treatment of materials.
2. Moisture content of materials.

G. Qualifications: Substantiate qualifications comply with specifications.

1. Fabricator

2. Installer

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications:

1. Regularly fabricates specified products.
2. Fabricated specified products with satisfactory service on five similar installations for minimum five years.

B. Installer Qualifications:

1. Regularly installs specified products.
2. Installed specified products with satisfactory service on five similar installations for minimum five years.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver products in manufacturer's original sealed packaging.
- B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, color, production run number, and manufacture date.
- C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.
- D. Store products indoors in dry, weathertight conditioned facility.
- E. Protect products from damage during handling and construction operations.

1.8 FIELD CONDITIONS

A. Environment:

1. Product Temperature: Minimum 21 degrees C (70 degrees F) for minimum 48 hours before installation.
2. Work Area Ambient Conditions: HVAC systems are complete, operational, and maintaining facility design operating conditions continuously, beginning 48 hours before installation until Government occupancy.
3. Install products when building is permanently enclosed and when wet construction is completed, dried, and cured.

4. Do not install finish lumber or millwork in any room or space where wet process systems such as concrete, masonry, or plaster work is not complete and dry.
- B. Field Measurements: Verify field conditions affecting fabrication and installation. Show field measurements on Submittal Drawings.
 1. Coordinate field measurement and fabrication schedule to avoid delay.

1.9 WARRANTY

- A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

- A. Design acoustical panel complying with specified performance:
 1. Surface Burning Characteristics: When tested according to ASTM E84.
 - a. Flame Spread Rating: 75 maximum.
 - b. Smoke Developed Rating: 450 maximum.

2.2 MATERIALS

- A. Grading and Marking: Factory mark with grade stamp lumber and plywood of inspection agency approved by the Board of Review, American Lumber Standard Committee.
- B. Lumber:
 1. Sizes:
 - a. Lumber Size references, unless otherwise specified, are nominal sizes, and actual sizes within manufacturing tolerances allowed by the standard under which product is produced.
 - b. Millwork, standing and running trim, and rails: Actual size as shown or specified.
 2. Hardwood: MM-L-736, species as specified for each item.
 3. Softwood: PS-20, exposed to view appearance grades:
 - a. Use C select or D select, vertical grain for transparent finish including stain transparent finish.

- b. Use Prime for painted or opaque finish.
- 4. Use edge grain Wood members exposed to weather.
- 5. Moisture Content:
 - a. 1-1/4 inches or less nominal thickness: 12 percent on 85 percent of the pieces and 15 percent on the remainder.
 - b. Other materials: According to standards under which the products are produced.
- 6. Fire Retardant Treatment: Mil. Spec. MIL-L-19140E.
 - a. Treatment and performance inspection by an independent and qualified testing agency that establishes performance ratings.
 - b. Each piece of treated material bear identification of the testing agency and indicate performance according to such rating of flame spread and smoke developed.
 - c. Treat wood for maximum flame spread of 25 and smoke developed of 25.
 - d. Fire Resistant Softwood Plywood:
 - 1) Grade A, Exterior, plywood for treatment.
 - 2) Surface Burning Characteristics: When tested according to ASTM E84.
 - a) Flame spread: 0 to 25.
 - b) Smoke developed: 100 maximum.
 - e. Fire Resistant Hardwood Plywood:
 - 1) Core: Fire retardant treated softwood plywood.
 - 2) Hardwood face and back veneers untreated.
 - 3) Factory seal panel edges.
- C. Plywood:
 - 1. Softwood Plywood: DOC PS1.
 - a. Plywood, 1/2 inch and thicker; minimum five ply construction, except 1-1/4 inch thick plywood minimum seven ply.
 - b. Plastic Laminate Plywood Cores:

- 1) Exterior Type, and species group.
 - 2) Veneer Grade: A-C.
 - c. Shelving Plywood:
 - 1) Interior Type, any species group.
 - 2) Veneer Grade: A-B or B-C.
 - d. Other: As specified for item.
- 2. Hardwood Plywood: HPVA: HP.1.
 - a. Species of Face Veneer: As shown or as specified with each particular item.
 - b. Grade:
 - 1) Transparent Finish: Type II (interior) A grade veneer.
 - 2) Paint Finish: Type II (interior) Sound Grade veneer.
 - c. Species and Cut: Plain sliced red oak rotary cut white birch unless specified otherwise.
- D. Particleboard: NPA A208.1, Type 1, Grade 1-M-3
 - 1. Plastic Laminate Particleboard Cores:
 - a. Use Industrial Grade Particle Board, Medium Density, Grade M-2, unless otherwise specified.
 - b. Use Industrial Grade Particle Board, Medium Density, Grade M-2, exterior grade, for countertops with sink(s).
- E. Building Board (Hardboard):
 - 1. ANSI/AHA A135.4, 1/4 inch thick unless specified otherwise.
 - 2. Perforated hardboard (Pegboard): Type 1, Tempered perforated 1/4 inch diameter holes, on 1 inch centers each way, smooth surface one side.
- F. Plastic Laminate: NEMA LD-3.
 - 1. Exposed Laminate Surfaces including Countertops, and Sides of Cabinet Doors: Grade HGL.
 - 2. Cabinet Interiors including Shelving: NEMA, CLS as a minimum, with the following:
 - a. Plastic laminate clad plywood or particle board.

- b. Resin impregnated decorative paper thermally fused to particle board.
- 3. Plastic Laminate Covered Wood Tops Backing: Grade HGP.
- 4. Postformed Surfaces: Grade HGP.
- 5. Laminate thickness for casework shall be as follows:
 - 1. Countertop Surfaces: .050" unless otherwise specified.
 - 2. All Other Surfaces: .028" (Vertical Grade) unless otherwise specified.

- G. Stainless Steel: ASTM A240, Type 302 or 304.
- H. Cast Aluminum: ASTM B26.
- I. Extruded Aluminum: ASTM B221.

2.3 PRODUCTS - GENERAL

- A. Basis of Design: Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Provide each product from one manufacturer
- C. Sustainable Construction Requirements:
 - 1. Low Pollutant-Emitting Materials: Comply with VOC limits specified in Section 01 81 11, SUSTAINABLE DESIGN REQUIREMENTS for the following products:
 - a. Non-flooring adhesives and sealants.
 - b. Aerosol adhesives.
 - c. Paints and coatings.
 - d. Wall base and accessories.
 - e. Composite wood and agrifiber.
- D. Acoustical Panel: Fabric-covered glass fiber panel.
 - 1. NRC 19 3/4 inch adhesive mounting direct to substrate.
 - 2. Glass Fiber Panel: 1 inch thick minimum, self-supporting of density required for minimum NRC.
 - 3. Fabric: Bonded directly to glass fiber panel face, flat wrinkle-free surface, stain and soil resistant.
 - 4. Adhesive: As recommended by panel manufacturers.

2.4 FABRICATION

A. General:

1. AWI Custom Grade for interior millwork.
2. Finish woodwork, free from pitch pockets.
3. Trim, standard stock molding and members of same species, except where special profiles are shown.
4. Plywood, minimum 1/4 inch, unless otherwise shown on Drawings or specified.
5. Edges of members in contact with concrete or masonry having a square corner caulking rebate.
6. Fabricate members less than 14 feet in length from one piece of lumber, back channeled and molded as shown.
7. Fabricate interior trim and items of millwork to be painted from jointed, built-up, or laminated members, unless otherwise shown on Drawings or specified.
8. Plastic Laminate Work:
 - a. Factory glued to either a plywood or a particle board core, thickness as shown on Drawings or specified.
 - b. Cover exposed edges with plastic laminate, except where aluminum, stainless steel, or plastic molded edge strips are shown on drawings or specified. Use plastic molded edge strips on 3/4 inch thick or thinner core material.
 - c. Provide plastic backing sheet on underside of countertops, vanity tops, thru-wall counter and sills including back splashes and end splashes of countertops.
 - d. Use backing sheet on concealed large panel surface when decorative face does not occur.
 - e. All exposed (open, not behind cabinet door) surfaces are to receive decorative plastic laminate, not white/cream

B. Seats and Benches:

1. Fabricate from 2 inch stock strips of plain-sawed White Oak, or Maple.

2. Solid seats securely glued together of spliced, doweled, or double tongued and grooved wood pieces. Where open joints are indicated, work each wood piece from solid stock.
 3. Round top edges and corners where exposed.
- C. Mounting Strips, Shelves and Rods:
1. Cut mounting strips from softwood stocks, 1 by 4 inches, exposed edge slightly rounded.
 2. Cut wood shelf from softwood 1 inch stock, of width shown, exposed edge slightly rounded.
 - a. Option: Provide 3/4 inch thick plywood with 3/4 inch softwood edge nosing on exposed edge, slightly rounded.
 3. Plastic laminate cover, 3/4 inch thick plywood or particle board core with plastic molded edge and end strips. Size, finish and number as shown on Drawings.
 4. Rod or Closet Bar: L03131.
 5. Combination Garment and Shelf Support, Intermediate Support for Closet Bar: B04051 for rods over 6 feet long.
- D. Pegboard:
1. Perforated hardboard sheet size as shown on Drawings.
 2. Spacing strip: 1/2 by 1/2 inch; glued to hardboard sheet.
 - a. Locate at perimeter of sheet edge.
 - b. Locate material intermediate spacing strips at 32 inches o.c.
 3. Cover exposed edge with 3/4 inch one quarter round edge trim and finish flush with hardboard surface. Glue to spacing strip and hard board.
- E. Thru-Wall Counter or Pass-Thru Counter.
1. Fabricate counter as shown on Drawings. Return hardwood edge to metal frame at ends. Fabricate to join other counters where shown.
 2. Cut to fit metal frame profile.

3. Fabricate to receive sliding pass window track when shown; specified in Section 08 56 19, PASS WINDOWS.
 4. Provide angle and fabricated shelf bracket supports.
- F. Receiving shelf in Agent Cashier:
1. Fabricate shelf as shown on Drawings over 3/4 inch thick core.
 2. Shelf Bracket: B04041.
- G. Plastic Laminate Counter or Work Tops:
1. Thickness: 1-1/4 inch thick core unless shown otherwise.
 - a. Edges:
 - 1) Decorative laminate for exposed edges of tops, back, and endsplash, 1-1/2 inches wide.
 - 2) Plastic or metal edges for top edges less than 1-1/2 inches wide.
 - b. Assemble backsplash and end splash to counter top.
 - c. Use one piece counters for straight runs.
 - d. Miter corners for field joints with overlapping blocking on underside of joint.
 2. Fabricate wood counter for work benches as shown on Drawings.

2.5 ACCESSORIES

- A. Hardware:
1. Rough Hardware:
 - a. Provide rough hardware with a standard plating, applied after punching, forming and assembly of parts; galvanized, cadmium plated, or zinc-coated by electric-galvanizing process. Galvanized where specified.
 - b. Fasteners:
 - 1) Bolts with Nuts: FF-N-836.
 - 2) Expansion Bolts: A-A-1922A.
 - 3) Screws: Fed. Spec. FF-S-111.
 2. Finish Hardware:
 - a. Door/Drawer Pulls: Wire pulls, B22011, 4 inches long, 5/16 inches in diameter.

- b. Drawer Slides:
 - 1. Pencil Drawer Slides: Knappe & Vogt #8200 or #8250 as appropriate, 75 lb. class, $\frac{3}{4}$ extensions, or approved equal.
 - 2. Box Drawers up to 6" deep: Knappe & Vogt #8300, 75 lb. class, $\frac{3}{4}$ extension, or approved equal.
 - 3. Box Drawers over 6" deep and File Drawers: Knappe & Vogt #8500, 150 lb. class, full extension, for 12" and 14" long drawers, or approved equal. Knappe & Vogt #8520, 175 lb. class, full extension for drawers longer than 14", or approved equal.
- c. Pocket Drawer Slides: Blum #270E series, or approved equal.
- d. Shelf Clips: Hafele #282.04.524, plug-in 32mm spoon type, or approved equal.
- e. Shelf Brackets: Hafele 287.35.159, or approved equal.
- f. Concealed (European Type) Hinges: B01602, Blum self-closing, full overlay, 125°, nickel plated, clip style, or approved equal.
- g. Door Locks: E07121. Keyed alike within an area, different areas keyed differently.
- h. Drawer Locks: E07041. Keyed alike within an area, different areas keyed differently.
- i. Door Silencers: Clear plastic with self-adhesive.

B. Adhesive:

- 1. Plastic Laminate: Fed. Spec. A-A-1936.
- 2. Interior Millwork: Unextended urea resin, unextended melamine resin, phenol resin, or resorcinol resin.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine and verify substrate suitability for product installation.
- B. Protect existing construction and completed work from damage.
- C. Clean substrates. Remove contaminants capable of affecting subsequently installed product's performance.

3.2 INSTALLATION

A. Installation:

1. Prime millwork receiving transparent finish and back-paint concealed surfaces.
2. Fasten trim with fine finishing nails, screws, or glue as required.
3. Set nails for putty stopping. Provide washers under bolt heads where no other bearing plate occurs.
4. Seal cut edges of fire retardant treated wood materials with a certified acceptable sealer.
5. Coordinate with plumbing and electrical work for installation of fixtures and service connections in millwork items.
6. Plumb and level items unless shown otherwise.
7. Nail finish at each blocking, lookout, or other nailer and intermediate points; toggle or expansion bolt in place where nails are not suitable.
8. Apply adhesive uniformly for full contact between substrate.

B. Seats and Benches:

1. Provide stainless steel countersunk screws to secure wood seats to brackets, angle, or pipe supports.
2. Provide stainless steel or chrome plated steel bolts for anchorage to walls. Use 1/4 inch toggle bolts in steel stud walls and hollow masonry. Use 1/4 inch expansion bolts in solid masonry or concrete.
3. Wall Benches: Fasten wall benches on stainless steel bar brackets, 6 inches near ends and maximum 3 feet on centers.
4. Corner Seats: Support on continuous angles secured to seat and walls.
5. Freestanding Benches: Provide pipe bench support within 8 inches of ends and maximum 3 feet on centers.

C. Pegboard or Perforated Hardboard:

1. Install board with chromium plated steel round-head toggle bolts or other fasteners capable of supporting board when loaded at 25 psf of board.

2. Install board with spacers to allow insertion and removal of hooks and accessories.
3. Install round trim, 1/4 inch at perimeter to finish flush with face of board and close space between wall and hardboard.

D. Wall Paneling:

1. Solid Hardwood Boards:

- a. Install furring strips, 1 by 3 inch at 16 inch centers horizontally between top and bottom strips. Fasten each stud with two screws.
- b. Install paneling laid vertically with end joints staggered between adjacent boards.
- c. Tightly butt joints and blind nail each board at each furring strip.

2. Plywood Paneling:

- a. Install furring strips horizontally, 1 by 3 inch under end joints of plywood and 16 inches on center between end strips. Install cross furring strips centered vertically at side joints of plywood paneling less than 1/2 inch thick. Fasten each stud with two screws.
- b. Install panels with long edge vertically and end joints aligned where exposed to view.
- c. Align V-grooves where end joints meet and maintain continuity of pattern.
- d. Apply continuous bead of adhesive to each furring strip to securely bond panel according to adhesive manufacturer's specifications.
- e. Nailing:
 - 1) Nail in V-grooves to horizontal furring strips and at panel edges and within 1 inch of ends except within 2 inches of end when panel end abutts other surfaces. Do not space nails in V-grooves over 6 inches, on center.
 - 2) Nail ungrooved panels at 16 inches centers to horizontal furring strips between end or edge nails. Set nails and fill hole with filler to match wood panel for panels thicker than 1/2 inch. Set nails flush with surface of panel thinner than 1/2 inch.

- 3) Use colored nails matching panel finish for prefinished panels or panels less than 1/2 inch thick.
3. Edge Trim and Base: Install solid wood as shown on Drawings, species same as wall paneling.
- E. Shelves:
 1. Install mounting strip at back wall and end wall for shelves in closets where shown secured with toggle bolts at each end, not over 24 inch centers between ends.
 - a. Nail Shelf to mounting strip at ends and to back wall strip at not over 36 inches on center.
 - b. Install metal bracket, ANSI A156.16, B04041, not over 4 feet centers when shelves exceed 6 feet in length.
 - c. Install metal bracket, ANSI A156.16, B04051, not over 4 feet on centers where shelf length exceeds 6 feet in length with metal rods, clothes hanger bars ANSI A156.16, L03131, of required length, full length of shelf.
 2. Install vertical slotted shelf standards to studs with toggle bolts through each fastener opening. Double slotted shelf standards is acceptable where adjacent shelves terminate.
 - a. Install brackets providing supports for shelf not over 36 inches on center and within 1/2 inch of shelf end unless shown otherwise.
 - b. Install shelves on brackets so front edge is restrained by bracket.
- F. Install with butt joints in straight runs and miter at corners.

3.3 CLEANING

- A. Remove excess adhesive before adhesive sets.
- B. Clean exposed surfaces. Remove contaminants and stains.
- C. Touch up damaged factory finishes.
 1. Repair painted surfaces with touch up primer.

3.4 PROTECTION

- A. Protect finish carpentry from traffic and construction operations.

- B. Cover finish carpentry with reinforced kraft paper, and plywood or hardboard.
- C. Remove protective materials immediately before acceptance.
- D. Repair damage.

--- E N D ---

**SECTION 07 13 00
SHEET WATERPROOFING**

PART 1 - GENERAL

1.1 DESCRIPTION:

This section specifies sheet waterproofing materials used for shower pan waterproofing in personnel showers.

1.2 QUALITY CONTROL:

Approval by the Resident Engineer is required of products of proposed manufacturers.

1.3 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data:
 - 1. Sheet waterproofing.
 - 2. Printed installation instructions.
- C. Certificates:
 - 1. Sheet waterproofing manufacturer's approval of adhesive used.
 - 2. Waterproofing tests report indicating that water test as specified has been made for each shower area and that each area was found to be watertight.
- D. Samples:
 - 1. Sheet waterproofing 6 inches square.
 - 2. Waterproofed building paper, 6 inches square.
 - 3. Adhesive, 1/2 pint.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING:

- A. Deliver materials to job in manufacturer's original unopened containers with brand name marked thereon.
- B. Unload and store so as to prevent injury to materials.
- C. Do not store material in areas where temperature is lower than 10°C (50°F), or where prolonged temperature is above 32°C (90°F).

1.5 WARRANTY

Shower pan waterproofing is subject to the terms of Article titled "Warranty of Construction", FAR clause 52.246-21, except that warranty period is extended to two years.

1.6 APPLICABLE PUBLICATIONS:

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced by basic designation only.
- B. Federal Specification (Fed. Spec.):
UU-B-790A INT AMDBuilding Paper, Vegetable Fiber: (Kraft, Waterproof, Water Repellent and Fire Resistant)

PART 2 - PRODUCTS

2.1 SHOWER PAN WATERPROOFING SHEET:

- A. Rubber type sheet formed of non-reinforced, homogeneous, impermeable, sheeting compound reduced to thermoplastic state, resistant to fungus, mildew and bacteria, not less than 60 mils thick.
- B. Asphaltic sheet formed with a laminated asphalt construction consisting of eight plies of Kraft paper bonded and saturated by seven layers of asphalt, reinforced with three layers of glass fibers and faced with polyethylene sheet; total weight 0.40 pounds per square foot.

2.2 ADHESIVES:

- A. As furnished by the manufacturer of the sheet waterproofing.
- B. Compatible with adjacent materials where contact occurs.

2.3 WATERPROOFED BUILDING PAPER:

Fed. Spec. UU-B-790, Type I, Grade C.

2.4 CONCRETE PATCHING COMPOUND:

- A. Portland cement base, acrylic polymer compound, manufactured specifically for resurfacing and leveling concrete floors.
- B. Have not less than the following physical properties:
 - 1. Compressive strength - 25 mPa (3500 psi).

2. Tensile strength - 7 mPa (1000 psi).
 3. Flexural strength - 7 mPa (1000 psi).
 4. Density - 1.9.
- C. Capable of being applied in layers up to two inches thick, being brought to a feather edge, and being troweled to a smooth finish.
- D. Ready for use in 48 hours after application.

PART 3 - EXECUTION

3.1 PREPARATION:

- A. Before installing shower pan waterproofing, adjoining surfaces shall be clean, smooth, firm and dry.
- B. Concrete surfaces shall be cured a minimum of seven days and be free from release agents, concrete curing agents, and other contaminants.
- C. Remove all high spots and loose and foreign particles and fill all voids, depressions joints and cracks with concrete patching compound.
- D. Ensure vertical surfaces have a continuous supportive back substrate for waterproofing.

3.2 INSTALLATION:

- A. Coat entire surfaces to receive shower pan waterproofing with adhesive spread at rate of one gallon per 40 square feet.
- B. Butt joints and cover with a strip of the waterproofing sheeting material eight inches in width and seal with adhesive.
- C. Carry sheeting up vertical surfaces not less than 4 inches above surface of shower floor. Carry over tops of curbs.
- D. Roll entire horizontal surfaces with 50 to 100 pounds roller and roll corners and vertical sections with a rubber roller to insure solid anchorage.
- E. Make cut out for floor drains and fit to drain for watertight assembly, coordinating with drain installation.

3.3 PROTECTION:

- A. When finish floor will not be immediately installed, protect waterproofing pan.
- B. Cover with 2 inches of sand or waterproofed building paper.

- C. Maintain protection until finished floor is placed.

3.4 WATER TEST:

- A. Test in presence of Resident Engineer for leaks before permanent finish is applied over shower pan waterproofing.
- B. Seal floor drain watertight and fill waterproofing pan with water to within approximately 1 inch of top of its vertical surfaces.
- C. When leakage occurs, repair waterproofing and repeat testing until no leakage occurs.
- D. Submit certificate to Resident Engineer of test results.

--- E N D ---

SECTION 07 13 52
MODIFIED BITUMINOUS SHEET WATERPROOFING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Modified bituminous sheet material used for exterior below grade waterproofing and split slab waterproofing.

1.2 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. Federal Specifications (Fed. Spec.):
 - 1. UU-B-790A Notice 2- Building Paper, Vegetable Fiber: (Kraft, Waterproofed, Water Repellent, and Fire Resistant).
- C. ASTM International (ASTM):
 - 1. C578-15b - Rigid, Cellular Polystyrene Thermal Insulation.
 - 2. D41/D41M-11 - Asphalt Primer Used in Roofing, Dampproofing and Waterproofing.
 - 3. D4586/D4586M-07(2012)e1 - Asphalt Roof Cement, Asbestos-Free.
 - 4. D6380/D6380M-03(2012)e1 - Asphalt Roll Roofing (Organic Felt).
- D. American Hardboard Association (AHA):
 - 1. A135.4-2012 - Basic Hardboard.

1.3 PREINSTALLATION MEETINGS

- A. Conduct preinstallation meeting at project site minimum 30 days before beginning Work of this section.
 - 1. Required Participants:
 - a. Contracting Officer's Representative.
 - b. Architect/Engineer.
 - c. Contractor.
 - d. Installer.

- e. Other installers responsible for adjacent and intersecting work, including substrate and flashing installers.
- 2. Meeting Agenda: Distribute agenda to participants minimum 3 days before meeting.
 - a. Installation schedule.
 - b. Installation sequence.
 - c. Preparatory work.
 - d. Protection before, during, and after installation.
 - e. Installation.
 - f. Terminations.
 - g. Transitions and connections to other work.
 - h. Inspecting and testing.
 - i. Other items affecting successful completion.
- 3. Document and distribute meeting minutes to participants to record decisions affecting installation.

1.4 SUBMITTALS

- A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Submittal Drawings:
 - 1. Show size, configuration, and installation details.
- C. Manufacturer's Literature and Data:
 - 1. Description of each product.
 - 2. Installation instructions.
 - 3. Warranty.
- D. Samples:
 - 1. Waterproofing and Flashing Sheet: 8 inch square, each type and color.
 - 2. Insulation: 8 inch square.
- E. Test reports: Certify products comply with specifications.

- F. Certificates: Certify products comply with specifications.
- G. Qualifications: Substantiate qualifications comply with specifications.
 - 1. Installer with project experience list.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Regularly installs specified products.
 - 2. Installed specified products with satisfactory service on five similar installations for minimum five years.
 - a. Project Experience List: Provide contact names and addresses for completed projects.

1.6 DELIVERY

- A. Deliver products in manufacturer's original sealed packaging.
- B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, color, production run number, and manufacture date.
- C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.7 STORAGE AND HANDLING

- A. Store products indoors in dry, weathertight conditioned facility.
- B. Protect products from damage during handling and construction operations.

1.8 FIELD CONDITIONS

- A. Environment:
 - 1. Product Temperature: Minimum 4 degrees C (40 degrees F) for minimum 48 hours before installation.
 - 2. Weather Limitations: Install waterproofing only during dry current and forecasted weather conditions.

1.9 WARRANTY

- A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

- B. Manufacturer's Warranty: Warrant waterproofing system against material and manufacturing defects and agree to repair any leak caused by a defect in the waterproofing system materials or workmanship of the installer.
 - 1. Warranty Period: 10 years.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Waterproofing System: Modified bituminous sheet material for exterior below grade and split slab waterproofing.

2.2 PRODUCTS - GENERAL

- A. Provide each product from one manufacturer.
- B. Sustainable Construction Requirements:
 - 1. Insulation Recycled Content:
 - a. Rigid Foam: 9 percent total recycled content, minimum.

2.3 BITUMINOUS SHEET

- A. Cold applied waterproofing membrane composed primarily of modified bituminous material prefabricated in sheet form designed for below grade exterior and split slab waterproofing. Sheet reinforced with fibers at manufacturer's option.
- B. Thickness: 60 mils, plus or minus 5 mils, and bonded to 4 mil) thick plastic sheet.
- C. Provide release sheet to prevent bonding of bituminous sheet to itself.

2.4 PROTECTION MATERIAL

- A. Polystyrene Insulation: ASTM C578, Type I or VIII, 1/2 inch minimum thickness.
- B. Hardboard: AHA A135.4, Service Type, 1/4 inch thick.
- C. Waterproofed Building Paper: Fed. Spec. UU-B-790A Notice 2, Type I, Grade C.
- D. Roll Roofing: ASTM D6380/D6380M, Class S (smooth), Type III with minimum net mass per unit area of roofing, 51 lbs./100 sq. ft.).

2.5 ACCESSORIES

- A. Patching Compound: Factory-prepared, non-shrinking, fast-setting, cementitious adhesive compound containing no ferrous metal or oxide.
- B. Primer: ASTM D41/D41M.
- C. Roof Cement: ASTM D4586/D4586M.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine and verify substrate suitability for product installation.
 - 1. Concrete surfaces cured minimum time recommended by waterproofing manufacturer.
 - 2. Substrate to be dry as recommended by waterproofing manufacturer.
- B. Protect existing construction and completed work from damage.
- C. Correct substrate deficiencies.
 - 1. Fill voids, joints, and cracks with patching compound.
- D. Clean substrates. Remove contaminants capable of preventing full adhesion.
- E. Priming:
 - 1. Prime concrete and masonry surfaces.
 - 2. Application method, amount of primer and condition or primer before installation of bituminous sheet as recommended by primer manufacturer.
 - 3. Reprime when required according to manufacturer's instructions.

3.2 INSTALLATION - GENERAL

- A. Install products according to manufacturer's instructions and approved submittal drawings.
 - 1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.

3.3 WATERPROOFING INSTALLATION

- A. Bituminous Sheet Installation:

1. Remove release sheet before application.
 2. Lay bituminous sheet from low point to high point so laps shed water.
 3. Treat expansion, construction and control joints and evident working cracks as expansion joints. Apply bituminous sheet in double thickness over joint by first applying a strip of bituminous sheet minimum 8 inches wide, centered over joint.
 4. Lap seams minimum 2 inches.
 5. Lay succeeding sheet with laps, and roll or press into place.
 6. Repair misaligned or inadequately lapped seams according to manufacturer's instructions.
 7. Seal seams and terminations according to sheet manufacturer's instructions.
- B. Corner Treatment:
1. At inside and outside corners, apply double cover using an initial strip minimum 11 inches wide, centered along axis of corner.
 2. Cover each strip completely by the regular application of bituminous sheet.
 3. Provide a fillet or cant on inside corners.
 4. Form cants using patching compound.
 5. Do not use wood, fiber, and insulating materials for cants.
- C. Projection Treatment:
1. Apply a double layer of bituminous sheet around pipes and similar projections at least 6 inches wide.
 2. At drains, apply a bead of roof cement over a double layer of bituminous sheet under clamping rings.
- D. Patching:
1. Repair tears, punctures, air blisters, and inadequately lapped seams, according to manufacturer's instructions before protection course is applied.
- E. Permanent Protection:
1. Vertical Surfaces:
 - a. Install hardboard, polystyrene insulation, or roll roofing protection material.
 - b. Extend protection full height from footing to top of backfill.

- c. If graded backfill is used, use roll roofing or hardboard.

F. Horizontal Surfaces:

- 1. Install roll roofing protection under concrete wearing courses.
- 2. Install roll roofing, hardboard, or polystyrene insulation under earth backfill.
- 3. Where no concrete wearing course occurs or when surfaces will bear heavy traffic and will not immediately be covered with a wearing course, use protection specified for vertical surfaces.

G. Temporary Protection:

- 1. When waterproofing materials are subjected to damage by sunlight and cannot be immediately protected as specified, protect waterproofing materials by waterproof building paper or suitable coating approved by manufacturer of waterproofing system used.

3.4 FIELD QUALITY CONTROL

A. Field Tests: Performed by testing laboratory specified in Section 01 45 29, TESTING LABORATORY SERVICES.

B. Testing:

- 1. Before any protection or wearing course is applied, test all horizontal applications of waterproofing with a minimum of 1 inch head of water above highest point and leave for 24 hours.
- 2. Mark leaks and repair when waterproofing is dry.
- 3. Certify, to Contracting Officer's Representative, that water tests have been made and that areas tested were found watertight.

C. Inspection:

- 1. Do not cover waterproofed surfaces by other materials or backfill until work is approved by Contracting Officer's Representative.

3.5 CLEANING

- A. Remove excess adhesive before adhesive sets.
- B. Clean exposed waterproofing surfaces. Remove contaminants and stains.

3.6 PROTECTION

- A. Protect waterproofing from construction operations.
- B. Remove protective materials immediately before acceptance.
- C. Repair damage.

--- E N D ---

SECTION 07 21 13
THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Thermal insulation.
 - a. Board or block insulation at foundation perimeter.
 - b. Batt or blanket insulation at exterior framed and furred walls.
 - c. Board or block insulation at floor assemblies above unconditioned spaces.
 - d. Board or block insulation at masonry cavity walls.
 - e. Loose fill insulation at exterior hollow masonry walls.
 - 2. Acoustical insulation.
 - a. Semi-rigid insulation at interior framed partitions.
 - b. Batt and blanket insulation at interior framed partitions and ceilings.
 - c. Board insulation at interior concrete and masonry partitions.

1.2 RELATED REQUIREMENTS

- A. Adhesives VOC Limits: Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.
- B. Insulating Precast Concrete: Section 03 45 00, PRECAST ARCHITECTURAL CONCRETE.
- C. Insulation for Cavity Face of Masonry: Section 04 20 00, UNIT MASONRY.
- D. Loose Fill Insulation for Attic Floors: Section 07 21 23, LOOSE-FILL INSULATION.
- E. Insulation for Insulated Wall Panels: Section 07 40 00, ROOFING AND SIDING PANELS.
- F. Safing Insulation: Section 07 84 00, FIRESTOPPING.
- G. Insulation for Sound Absorptive Pad: Section 09 54 23. LINEAR METAL CEILINGS.
- H. Insulation for Prefabricated Metal Buildings: Section 13 34 19, METAL BUILDING SYSTEMS.
- I. Insulation for Piping and Storage Tanks: Section 23 56 00, SOLAR ENERGY HEATING SYSTEM.

1.3 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. ASTM International (ASTM):
 - 1. C516-08(2013)e1 - Vermiculite Loose Fill Thermal Insulation.
 - 2. C549-06(2012) - Perlite Loose Fill Insulation.
 - 3. C552-15 - Cellular Glass Thermal Insulation.
 - 4. C553-13 - Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
 - 5. C578-15 - Rigid, Cellular Polystyrene Thermal Insulation.
 - 6. C591-15 - Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation.
 - 7. C612-14 - Mineral Fiber Block and Board Thermal Insulation.
 - 8. C665-12 - Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
 - 9. C728-15 - Perlite Thermal Insulation Board.
 - 10. C954-15 - Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Base to Steel Studs From 0.033 (0.84 mm) inch to 0.112 inch (2.84 mm) in thickness.
 - 11. C1002-14 - Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
 - 12. D312/D312M-15 - Asphalt Used in Roofing.
 - 13. E84-15a - Surface Burning Characteristics of Building Materials.
 - 14. F1667-15 - Driven Fasteners: Nails, Spikes, and Staples.

1.4 SUBMITTALS

- A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Submittal Drawings:
 - 1. Show insulation type, thickness, and R-value for each location.
- C. Manufacturer's Literature and Data:

1. Description of each product.
 2. Adhesive indicating manufacturer recommendation for each application.
- D. Sustainable Construction Submittals:
1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.
 2. Low Pollutant-Emitting Materials:
 - a. Show volatile organic compound types and quantities.

1.5 DELIVERY

- A. Deliver products in manufacturer's original sealed packaging.
- B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, production run number, and manufacture date.
- C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.6 STORAGE AND HANDLING

- A. Store products indoors in dry, weathertight facility.
- B. Protect products from damage during handling and construction operations.
- C. Protect foam plastic insulation from UV exposure.

1.7 WARRANTY

- A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 INSULATION - GENERAL

- A. Insulation Thickness:
 1. Provide thickness required by R-value shown on drawings.
 2. Provide thickness indicated when R-value is not shown on drawings.
- B. Insulation Types:
 1. Provide one insulation type for each application.
- C. Sustainable Construction Requirements:

1. Insulation Recycled Content:
 - a. Polyisocyanurate/polyurethane rigid foam: 9 percent recovered material.
 - b. Polyisocyanurate/polyurethane foam-in-place: 5 percent recovered material.
 - c. Glass fiber reinforced: 6 percent recovered material.
 - d. Phenolic rigid foam: 5 percent recovered material.
 - e. Rock wool material: 75 percent recovered material.
2. Low Pollutant-Emitting Materials: Comply with VOC limits specified in Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS for the following products:
 - a. Non-Flooring Adhesives and Sealants.

2.2 THERMAL INSULATION

- A. Perimeter Insulation In Contact with Soil:
 1. Polystyrene Board: ASTM C578, Type IV, V, VI, VII, or IX.
 2. Cellular Glass Block: ASTM C552, Type I or IV.
- B. Exterior Framing or Furring Insulation:
 1. Mineral Fiber: ASTM C665, Type II, Class C, Category I where concealed by thermal barrier.
 2. Mineral Fiber: ASTM C665, Type III, Class A at other locations.
- C. Inside Face of Exterior Wall Insulation:
 1. Mineral Fiber Board: ASTM C612, Type IB or II.
 2. Perlite Board: ASTM C728.
 3. Cellular Glass Block: ASTM C552, Type I.
- D. Floor Assemblies Above Unconditioned Spaces:
 1. Mineral Fiber Board: ASTM C612, Type IB or Type II.
 2. Perlite Board: ASTM C728.
 3. Cellular Glass Block: ASTM C552, Type I.
- E. Masonry Cavity Wall Insulation:
 1. Mineral Fiber Board: ASTM C612, Type II, with vapor retarder facing; maximum permeance 0.5 perms.

2. Polyurethane or Polyisocyanurate Board: ASTM C591, Type I, with vapor retarder facing; maximum permeance 0.5 perms.
 3. Polystyrene Board: ASTM C578, Type X.
 4. Perlite Board: ASTM C728.
 5. Cellular Glass Block: ASTM C552, Type I or IV.
- F. Masonry Fill Insulation:
1. Vermiculite Insulation: ASTM C516, Type II.
 2. Perlite Insulation: ASTM C549, Type IV.
- G. Light Well Insulation
1. Closed-cell sprayed polyurethane foam, JM Corband MCS ICC-ESR 3159 or approved alternate

2.3 ACOUSTICAL INSULATION

- A. Semi Rigid, Batts and Blankets:
1. Widths and lengths to fit tight against framing.
 2. Mineral Fiber boards: ASTM C553, Type II, flexible, or Type III, semi rigid FSK faced.
 - a. Density: nominal 4.5 pound.
 3. Mineral Fiber Batt or Blankets: ASTM C665 FSK faced.
 4. Maximum Surface Burning Characteristics: ASTM E84.
 - a. Flame Spread Rating: 25.
 - b. Smoke Developed Rating: 450.
- B. Sound Deadening Board:
1. Mineral Fiber Board: ASTM C612, Type IB.
 - a. Thickness: 1/2 inch.
 2. Perlite Board: ASTM C728.
 - a. Thickness: 1/2 inch.

2.4 ACCESSORIES

- A. Fasteners:
1. Staples or Nails: ASTM F1667, zinc-coated, size and type to suit application.

2. Screws: ASTM C954 or ASTM C1002, size and length to suit application with washer minimum 2 inches diameter.
3. Impaling Pins: Steel pins with head minimum 2 inches diameter.
 - a. Length: As required to extend beyond insulation and retain cap washer when washer is placed on pin.
 - b. Adhesive: Type recommended by manufacturer to suit application.
- B. Insulation Adhesive:
 1. Nonflammable type recommended by insulation manufacturer to suit application.
- C. Tape:
 1. Pressure sensitive adhesive on one face.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine and verify substrate suitability for product installation.
- B. Protect existing construction and completed work from damage.
- C. Clean substrates. Remove contaminants capable of affecting subsequently installed product's performance.

3.2 INSTALLATION - GENERAL

- A. Install products according to manufacturer's instructions and approved submittal drawings.
 1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.
- B. Install insulation with vapor barrier facing the heated side, unless indicated otherwise.
- C. Install board and block insulation with joints close and flush, in regular courses, and with end joints staggered.
- D. Install batt and blanket insulation with joints tight. Fill framing voids completely. Seal penetrations, terminations, facing joints, facing cuts, tears, and unlapped joints with tape.

- E. Fit insulation tight against adjoining construction and penetrations, unless indicated otherwise.

3.3 THERMAL INSULATION

A. Perimeter Insulation In Contact with Soil:

- 1. Vertical insulation:
 - a. Fill joints of insulation with same material used for bonding.
 - b. Bond polystyrene board to surfaces with adhesive.
 - c. Bond cellular glass insulation to surfaces with hot asphalt or adhesive cement.
- 2. Horizontal insulation under concrete floor slab:
 - a. Lay insulation boards and blocks horizontally on level, compacted and drained fill.
 - b. Extend insulation from foundation walls towards center of building minimum 24 inches.

B. Exterior Framing or Furring Insulation:

- 1. General:
 - a. Open voids are not acceptable.
 - b. Pack insulation around door frames and windows, in building expansion joints, door soffits, and other voids.
 - c. Pack behind outlets, around pipes, ducts, and services encased in walls.
 - d. Hold insulation in place with pressure sensitive tape.
 - e. Lap facing flanges together over framing for continuous surface. Seal penetrations through insulation and facings.
- 2. Metal Studs:
 - a. Fasten insulation between metal studs, framing, and furring with pressure sensitive tape continuous along flanged edges.
- 3. Wood Studs:
 - a. Fasten insulation between wood studs or framing with nails or staples through flanged edges on face of stud.

- b. Space fastenings maximum six inches apart.
- 4. Roof Rafters and Floor Joists:
 - a. Friction fit insulation between framing to provide minimum 2 inch air space between insulation and roof sheathing and subfloor.
- 5. Ceilings and Soffits:
 - a. Wood Framing:
 - 1) Fasten blanket insulation between wood framing and joists with nails or staples through flanged edges of insulation.
 - 2) Space fastenings maximum 6 inches on center.
 - b. Metal Framing:
 - 1) Fasten insulation between metal framing with pressure sensitive tape continuous along flanged edges.
 - 2) At metal framing and ceilings suspension systems, install insulation above suspended ceilings and metal framing at right angles to main runners and framing.
 - 3) Tape insulation tightly together without gaps. Cover metal framing members with insulation.
 - c. Ceiling Transitions:
 - 1) In areas where suspended ceilings transition to structural ceiling, install blanket or batt insulation.
 - 2) Extend insulation from suspended ceiling to underside of structure above.
 - 3) Secure blanket and batt with continuous cleats to structure above.
- C. Inside Face of Exterior Wall Insulation:
 - 1. Location: On interior face of solid masonry and concrete walls, beams, beam soffits, underside of floors, and to face of studs to support interior wall finish where indicated.
 - 2. Bond insulation to solid vertical surfaces with adhesive. Fill joints with adhesive cement.

3. Fasten board insulation to face of studs with screws, nails or staples. Space fastenings maximum 12 inches on center. Stagger fasteners at board joints. Install fasteners at each corner.
- D. Floor Assemblies Above Unconditioned Spaces:
1. Use impaling pins for attach insulation to underside of horizontal surfaces. Space fastenings as required to hold insulation in place and prevent sagging.
 - a. Bond insulation with adhesive when separate vapor retarder is used.
- E. Masonry Cavity Wall Insulation:
1. Install insulation on exterior faces of concrete and masonry inner wythes of cavity walls.
 2. Bond polystyrene board to surfaces with adhesive.
 3. Bond polyurethane or polyisocyanurate board, and perlite board to surfaces with adhesive.
 4. Bond cellular glass insulation to surfaces with hot asphalt or adhesive cement.
 5. Fill insulation joints with same material used for bonding.
- F. Masonry Fill Insulation:
1. Pour fill insulation in masonry unit hollow cores from tops of walls, or from sill where windows or other openings occur.
 2. Pour in lifts of maximum 20 feet).

3.4 ACOUSTICAL INSULATION

- A. General:
1. Install insulation without voids.
 2. Pack insulation around door frames and windows, in building expansion joints, door soffits, and other voids.
 3. Pack behind outlets, around pipes, ducts, and services encased in walls.
 4. Hold insulation in place with pressure sensitive tape.
 5. Lap facer flanges together over framing for continuous surface. Seal all penetrations through the insulation and facers.

6. Do not compress insulation below required thickness except where embedded items prevent required thickness.
- B. Semi Rigid, Batts and Blankets:
 1. When insulation is not full thickness of cavity, adhere insulation to one side of cavity, maintaining continuity of insulation and covering penetrations or embedments.
 - a. Wood Framing:
 - 1) Fasten blanket insulation between wood framing and joists with nails or staples through flanged edges of insulation.
 - 2) Space fastenings maximum 6 inches on center.
 - b. Metal Framing:
 - 1) Fasten insulation between metal framing with pressure sensitive tape continuous along flanged edges.
 - 2) At metal framing or ceilings suspension systems, install blanket insulation above suspended ceilings or metal framing at right angles to the main runners or framing.
 - 3) Tape insulation tightly together so no gaps occur and metal framing members are covered by insulation.
- C. Sound Deadening Board:
 1. Secure with adhesive to masonry and concrete walls and with screws to metal and wood framing. Secure sufficiently in place until subsequent cover is installed. Seal all cracks with caulking.

3.5 CLEANING

- A. Remove excess adhesive before adhesive sets.

3.6 PROTECTION

- A. Protect insulation from construction operations.
- B. Repair damage.

-- E N D --

SECTION 07 22 00
ROOF AND DECK INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
- B. Roof and deck insulation, substrate board, vapor retarder, and cover board on new metal deck substrates ready to receive roofing or waterproofing membrane.
- C. Repairs and alteration work to existing roof insulation.

1.2 RELATED REQUIREMENTS

- A. Non-Flooring Adhesives and Sealants VOC Limits: Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.
- B. Wood Cants, Blocking, and Edge Strips: Section 06 10 00, ROUGH CARPENTRY.

1.3 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. American Society of Heating, Refrigeration and Air Conditioning (ASHRAE):
 - 1. Standard 90.1-13 - Energy Standard for Buildings Except Low-Rise Residential Buildings.
- C. ASTM International (ASTM):
 - 1. C208-12 - Cellulosic Fiber Insulating Board.
 - 2. C552-15 - Cellular Glass Thermal Insulation.
 - 3. C726-05 - Mineral Fiber Roof Insulation Board.
 - 4. C728-15 - Perlite Thermal Insulation Board.
 - 5. C1177/C1177M-13 - Glass Mat Gypsum Substrate for Use as Sheathing.
 - 6. C1278/C1278M-07a(2015) - Fiber-Reinforced Gypsum Panel.
 - 7. C1289-15 - Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
 - 8. C1396/C1396M-14a - Gypsum Board.
 - 9. D41/D41M-11 - Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing.
 - 10. D312-06 - Asphalt Used in Roofing.

11. D1970/D1970M-15 - Self-Adhering Polymer Modified Bituminous Sheet Materials
Used as Steep Roofing Underlayment for Ice Dam Protection.
 12. D2178/D2178M-15 - Asphalt Glass Felt Used in Roofing and Waterproofing.
 13. D2822/D2822M-11 - Asphalt Roof Cement, Asbestos Containing.
 14. D4586/D4586M-07(2012)e1 - Asphalt Roof Cement, Asbestos-Free.
 15. E84-15a - Surface Burning Characteristics of Building Materials.
 16. F1667-15 - Driven Fasteners: Nails, Spikes, and Staples.
- D. National Roofing Contractors Association (NRCA):
1. Manual-15 - The NRCA Roofing Manual: Membrane Roof Systems.
- E. U.S. Department of Agriculture (USDA):
1. USDA BioPreferred Program Catalog.
- F. UL LLC (UL):
1. Listed - Online Certifications Directory.
- G. U.S. Department of Commerce National Institute of Standards and Technology (NIST):
1. DOC PS 1-09 - Structural Plywood.
 2. DOC PS 2-04 - Performance Standard for Wood-Based Structural-Use Panels.

1.4 SUBMITTALS

- A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Submittal Drawings:
1. Show size, configuration, and installation details.
 - a. Nailers, cants, and terminations.
 - b. Layout of insulation showing slopes, tapers, penetrations, and edge conditions.
- C. Manufacturer's Literature and Data:
1. Description of each product.
- D. Samples:
1. Roof insulation, each type.
 2. Fasteners, each type.

E. Sustainable Construction Submittals:

1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.
2. Biobased Content:
 - a. Show type and quantity for each product.
3. Low Pollutant-Emitting Materials:
 - a. Show volatile organic compound types and quantities.
 - b. Certify each composite wood and agrifiber product contain no added urea formaldehyde.

F. Qualifications: Substantiate qualifications meet specifications.

1. Installer.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Same installer as Division 07 roofing section installer.

1.6 DELIVERY

- A. Comply with recommendations of NRCA Manual.
- B. Deliver products in manufacturer's original sealed packaging.
- C. Mark packaging, legibly. Indicate manufacturer's name or brand, type, and manufacture date.
- D. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.7 STORAGE AND HANDLING

- A. Comply with recommendations of NRCA Manual.
- B. Store products indoors in dry, weathertight facility.
- C. Protect products from damage during handling and construction operations.

1.8 FIELD CONDITIONS

- A. Environment:

1. Install products when existing and forecasted weather permit installation according to manufacturer's instructions.

1.9 WARRANTY

- A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."
- B. Manufacturer's Warranty: Warrant substrate board, vapor retarder, insulation, and cover board against material and manufacturing defects as part of Division 07 roofing system warranty.

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

- A. Insulation Thermal Performance:
 1. Overall Average R-Value: RSI-57 (R-33), minimum.
 2. Any Location R-Value: RSI-17 (R-10), minimum.
- B. Fire and Wind Uplift Resistance: Provide roof insulation complying with requirements specified in Division 07 roofing section.
- C. Insulation on Metal Decking: UL labeled indicating compliance with one of the following:
 1. UL Listed.
 2. Insulation Surface Burning Characteristics: When tested according to ASTM E84.
 - a. Flame Spread Rating: 75 maximum.
 - b. Smoke Developed Rating: 150 maximum.

2.2 PRODUCTS - GENERAL

- A. Provide each product from one manufacturer.
- B. Sustainable Construction Requirements:
 1. Insulation Recycled Content:
 - a. Mineral Fiber: 75 percent total recycled content, minimum.
 - b. Fiberglass: 20 percent total recycled content, minimum.
 - c. Cellulose: 75 percent post-consumer recycled content, minimum.

- d. Perlite Composite Board: 23 percent post-consumer recycled content, minimum.
 - e. Rigid Foam: 9 percent total recycled content, minimum.
 - f. Glass Fiber Reinforced Rigid Foam: 6 percent total recycled content, minimum.
2. Low Pollutant-Emitting Materials: Comply with VOC limits specified in Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS for the following products:
- a. Non-flooring adhesives and sealants.
 - b. Composite wood and agrifiber.
3. Bio-Based Materials: Where applicable, provide products designated by USDA and meeting or exceeding USDA recommendations for bio-based content, and products meeting Rapidly Renewable Materials and certified sustainable wood content definitions; refer to www.biopreferred.gov.

2.3 ADHESIVES

- A. Primer: ASTM D41/D41M.
- B. Asphalt: ASTM D312, Type III or IV for vapor retarders and insulation.
- C. Modified Asphaltic Insulation Adhesive: Insulation manufacturer's recommended modified asphaltic, asbestos-free, cold-applied adhesive formulated to adhere roof insulation to substrate or to another insulation layer.
- D. Bead-Applied Urethane Insulation Adhesive: Insulation manufacturer's recommended bead-applied, low-rise, one- or multicomponent urethane adhesive formulated to adhere roof insulation to substrate or to another insulation layer.
- E. Full-Spread Applied Urethane Insulation Adhesive: Insulation manufacturer's recommended spray-applied, low-rise, two-component urethane adhesive formulated to adhere roof insulation to substrate or to another insulation layer.
- F. Roof Cement: Asbestos free, ASTM D2822/D2822M, Type I or Type II; or, ASTM D4586/D4586M, Type I or Type II.

2.4 ROOF AND DECK INSULATION

- A. Roof and Deck Insulation, General: Preformed roof insulation boards approved by roofing manufacturer.
- B. Polyisocyanurate Board Insulation: ASTM C1289, Type II, Class 1, Grade 2, faced with glass fiber reinforced cellulosic felt facers on both major surfaces of the core foam.

2.5 INSULATION ACCESSORIES

- A. Glass (Felt): ASTM D2178/D2178M, Type VI, heavy duty ply sheet.
- B. Cants and Tapered Edge Strips:
 - 1. Wood Cant Strips: Refer to Section 06 10 00, ROUGH CARPENTRY.
 - 2. Insulation Cant Strips: ASTM C208, Type II, Grade 1, cellulosic-fiber insulation board.
 - 3. Tapered Edge Strips: 1/12 (1 inch per 12 inches, from 12 inches to 18 inches wide).
 - a. Cellulosic Fiberboard: ASTM C208.
 - b. Mineral Fiberboard: ASTM C726.
 - c. Perlite Board: ASTM C728.
- C. Vapor Retarder:
 - 1. Glass-Fiber Felts: ASTM D2178/D2178M, Type IV, asphalt impregnated.
 - 2. Self-Adhering Sheet Vapor Retarder: ASTM D1970/D1970M, minimum 40 mils thick membrane of HDPE film fully coated with asphalt adhesive, or 30 to 40 mils thick membrane of butyl rubber based adhesive backed by a layer of high density cross-laminated polyethylene; maximum permeance rating of 0.1 perms.
- D. Substrate Board:
 - 1. Gypsum Board: ASTM C1396/C1396M, 5/8 inch thick, Type X.
 - 2. Glass-Mat, Water-Resistant Gypsum Roof Board: ASTM C1177/C1177M, 1/2 inch Type X, 5/8 inch thick, factory primed.
 - 3. Cellulosic-Fiber-Reinforced, Water-Resistant Gypsum Roof Board: ASTM C1278/C1278M, 1/2 inch thick.
 - 4. Perlite Board Insulation: ASTM C728, 3/4 inch
- E. Cover Board:

1. Glass-Mat, Water-Resistant Gypsum Roof Board: ASTM C1177/C1177M, 1/2 inch thick, factory primed.
2. Cellulosic-Fiber-Reinforced, Water-Resistant Gypsum Roof Board: ASTM C1278/C1278M, 1/2 inch thick.
3. Cellulosic-Fiber Insulation Board: ASTM C208, Type II, Grade 2, 1/2 inch thick.
4. Oriented Strand Board: DOC PS 2, Exposure 1, 7/16 inch thick.

2.6 ACCESSORIES

- A. Fasteners: Corrosion-resistant carbon steel fasteners and galvalume-coated steel or plastic round plates for fastening substrate board and insulation to roof deck.
- B. Nails: ASTM F1667; type to suit application.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Comply with requirements of Division 07 roofing section.

3.2 PREPARATION

- A. Examine and verify substrate suitability for product installation.
- B. Protect existing construction and completed work from damage.

3.3 INSTALLATION - GENERAL

- A. Install products according to manufacturer's instructions.
 1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.
- B. Comply with requirements of UL for insulated steel roof deck.
- C. Attach substrate board and other products to meet requirements of Division 07 roofing section.

3.4 SUBSTRATE BOARD INSTALLATION

- A. Fasten substrate board to top flanges of steel decking to resist uplift pressures according requirements for specified roofing system.

1. Locate the long dimension edge joints solidly bearing on top of decking ribs.

3.5 VAPOR RETARDER INSTALLATION

A. Vapor Retarder Installation, General:

1. Install continuous vapor retarder on roof decks where indicated.
2. At vertical surfaces, turn up vapor retarder to top of insulation or base flashing.
3. Seal penetrations through vapor retarder with roof cement to prevent moisture entry from below.

B. Cast in Place Concrete Decks, Except Insulating Concrete:

1. Prime deck as specified.
2. Apply two plies of asphalt saturated felt mopped down to deck.

C. Precast Concrete Unit Decks Without Concrete Topping:

1. Prime deck as specified.
2. Apply two plies of asphalt saturated felt.
3. Mop to deck, keeping bitumen 4 inches away from joints of precast units. Bridge joints with felt. Mop between plies as specified.

3.6 INSULATION INSTALLATION

A. Insulation Installation, General:

1. Base Sheet: Where required by roofing system, install one lapped base sheet specified in Division 07 roofing section by mechanically fastening to roofing substrate before installation of insulation.
2. Cant Strips: Install preformed insulation cant strips at junctures of roofing system with vertical construction.
3. Use same insulation as existing for roof repair and alterations unless specified otherwise.

B. Insulation Thickness:

1. Thickness of roof insulation shown on drawings is nominal. Provide thickness required to comply with specified thermal performance.

2. Insulation on Metal Decks: Provide insulation in minimum thickness recommended by insulation manufacturer to span deck flutes. Support edges of insulation on metal deck ribs.
3. When actual insulation thickness differs from drawings, coordinate alignment and location of roof drains, flashing, gravel stops, fascias and similar items.
4. Where tapered insulation is used, maintain insulation thickness at high points and roof edges shown on drawings.
 - a. Low Point Thickness: Minimum 1-1/2 inches.
5. Use minimum two layers of insulation when required thickness is 2.7 inch or greater.
- C. Lay insulating units with close joints, in regular courses and with end joints staggered.
 1. Stagger joints between layers minimum 6 inches.
- D. Lay units with long dimension perpendicular to the rolled (longitudinal) direction of the roofing felt.
- E. Seal cut edges at penetrations and at edges against blocking with bitumen or roof cement.
- F. Cut to fit tightly against blocking or penetrations.
- G. Cover all insulation installed on the same day; comply with temporary protection requirements of Division 07 roofing section.
- H. Installation Method:
 1. Adhered Insulation:
 - a. Prime substrate as required.
 - b. Set each layer of insulation firmly in solid mopping of hot asphalt.
 - c. Set each layer of insulation firmly in ribbons of bead-applied insulation adhesive.
 - d. Set each layer of insulation firmly in uniform application of full-spread insulation adhesive.
 2. Mechanically Fastened Insulation:

- a. Fasten insulation according to requirements in Division 07 roofing section.
- b. Fasten insulation to resist uplift pressures specified in Division 07 roofing section.
- 3. Mechanically Fastened and Adhered Insulation:
 - a. Fasten first layer of insulation according to "Mechanically Fastened Insulation" requirements.
 - b. Fasten each subsequent layer of insulation according to "Adhered Insulation" requirements.

3.7 COVER BOARD INSTALLATION

- A. Install cover boards over insulation with long joints in continuous straight lines with staggered end joints.
- B. Offset cover board joints from insulation joints 6 inches, minimum.
- C. Secure cover boards according to "Adhered Insulation" requirements.

-- E N D --

SECTION 07 24 00
EXTERIOR INSULATION AND FINISH SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Direct exterior finish systems (DEFS).
 - 2. Exterior insulation and finish systems (EIFS).
 - 3. Unit finishes as accent trim within DEFS.

1.2 RELATED REQUIREMENTS

- A. Gypsum Board Sheathing 09 29 00, GYPSUM SHEATHING.
- B. Ceramic Tile: Section 09 30 13, CERAMIC/PORCELAIN TILING.
- C. Color: Section 09 06 00, SCHEDULE FOR FINISHES.

1.3 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. American National Standards Institute (ANSI):
 - 1. A108/A118/A136-14 - Installation of Ceramic Tile.
 - 2. A137.1-12 - Ceramic Tile - Version 1.
- C. ASTM International (ASTM):
 - 1. B117-11 - Operating Salt Spray (Fog) Apparatus.
 - 2. C67-14 - Sampling and Testing Brick and Structural Clay Tile.
 - 3. C177-13 - Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
 - 4. C297/C297M-15 - Flatwise Tensile Strength of Sandwich Constructions.
 - 5. C578-15 - Rigid, Cellular Polystyrene Thermal Insulation.
 - 6. C666/C666M-15 - Resistance of Concrete to Rapid Freezing and Thawing.
 - 7. C920-14a - Elastomeric Joint Sealants.
 - 8. D968-15 - Abrasion Resistance of Organic Coatings by Falling Abrasive.

9. D2794-93(2010) - Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
10. E84-15a - Surface Burning Characteristics of Building Materials.
11. E96/E96M-15 - Water Vapor Transmission of Materials.
12. E119-15 - Fire Tests of Building Construction and Materials.
13. E330/E330M-14 - Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
14. E331-00(2009) - Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Wall by Uniform Static Air Pressure Differences.
15. E2486/E2486M-13 - Impact Resistance of Class PB and PI Exterior Insulation and Finish Systems (EIFS).
16. G90-10 - Performing Accelerated Outdoor Weathering of Nonmetallic Materials Using Concentrated Natural Sunlight.

1.4 PREINSTALLATION MEETINGS

- A. Conduct preinstallation meeting minimum 30 days before beginning Work of this section.
 1. Required Participants:
 - a. Contracting Officer's Representative.
 - b. Architect/Engineer.
 - c. Contractor.
 - d. Installer.
 - e. Other installers responsible for adjacent and intersecting work, including air barriers and sealants.
 2. Meeting Agenda: Distribute agenda to participants minimum 3 days before meeting.
 - a. Installation schedule.
 - b. Installation sequence.
 - c. Preparatory work.
 - d. Protection before, during, and after installation.

- e. Installation.
 - f. Terminations.
 - g. Transitions and connections to other work.
 - h. Inspecting and testing.
 - i. Other items affecting successful completion.
3. Document and distribute meeting minutes to participants to record decisions affecting installation.

1.5 SUBMITTALS

- A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Submittal Drawings:
 - 1. Show size, configuration, and fabrication and installation details.
 - 2. Show details for corner treatment, sills, soffits, dentils, quoins, lintels, openings, penetrations, flashing, and other special applications.
- C. Manufacturer's Literature and Data:
 - 1. Description of each product.
 - 2. Installation instructions.
 - 3. Warranty.
- D. Samples:
 - 1. Two 1 foot square samples of EIFS finishes over cement board identical to proposed installation in thickness, color, texture insulation and workmanship.
- E. Test reports: Certify each product and complete system complies with specifications.
- F. Qualifications: Substantiate qualifications comply with specifications.
 - 1. Installer

1.6 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Regularly installs specified products.

2. Installed specified products with satisfactory service on five similar installations for minimum five years.

1.7 DELIVERY

- A. Deliver products in manufacturer's original sealed packaging.
- B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, production run number, and manufacture date.
- C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.8 STORAGE AND HANDLING

- A. Store products indoors in dry, weathertight conditioned facility.
- B. Protect products from damage during handling and construction operations.

1.9 FIELD CONDITIONS

- A. Environment:
 1. Unless greater temperature is required by system manufacturer, install products only when ambient air temperature is minimum 7 degrees C (45 degrees F) and rising and predicted to persist for 24 hours after installation.

1.10 WARRANTY

- A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."
- B. Manufacturer's Warranty: Warrant EIFS system materials against material and manufacturing defects.
 1. Warranty Period: 10 years.

PART 2 - PRODUCTS

2.1 PRODUCTS - GENERAL

- A. Basis of Design: Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Provide system components from one manufacturer and from one production run.

2.2 DIRECT EXTERIOR FINISH SYSTEMS (DEFS)

- A. Description: Reinforced cement board joints, synthetic stucco base coat and simulated stucco finish coat applied directly to gypsum board sheathing.
- B. Stucco Finish:
 - 1. Base coat: Ready-to-mix, Portland cement mortar containing dry latex polymers.
 - 2. Finish coat: Pre-colored, ready-mixed, polymeric coating.
- C. Performance Requirements:
 - 1. Surface Burning Characteristics: When tested according to ASTM E84.
 - a. Flame Spread Rating: 25 maximum.
 - b. Smoke Developed Rating: 450 maximum.
 - 2. Abrasion Resistance: ASTM D968; 500 liters of light smoothing sand with no loss of film integrity.
 - 3. Bond Strength (with gypsum board sheathing): ASTM C297/C297M, 345 kPa (50 psi).
 - 4. Salt Spray Resistance: ASTM B117; 300 hours exposure with no deleterious effects.
 - 5. Freeze/Thaw Resistance (with gypsum board sheathing): ASTM C666/C666M; 100 Cycles with no deterioration, no delamination.
 - 6. Accelerated Weathering: ASTM G90; 2000 hours with no deterioration.
 - 7. Rapid Deformation: ASTM D2794; No cracking or impact failure.
- D. Accessories:
 - 1. Trim, control joints and corner beads as recommended by DEFS manufacturer.
 - 2. Joint Reinforcement:
 - a. Reinforcing tape: Minimum 4 inch wide, polymer coated, open mesh glass fiber tape.
 - b. Tape embedding material: Ready-to-mix Portland cement mortar base coat containing dry latex polymers.
 - 3. Sealant: ASTM C920, Class 50 with 100 percent recovery. Type, grade and use as recommended by the sealant manufacturer.

2.3 EXTERIOR INSULATION AND FINISH SYSTEM (EIFS)

- A. Description: Polymer-Based (PB) system consists of Type I molded rigid polystyrene insulation adhered to sheathing and finished with glass-fiber-mesh reinforced based-coat and textured finish coat.
- B. Performance Requirements:
 - 1. Surface Burning Characteristics: When tested according to ASTM E84.
 - a. Flame Spread Rating: 25 maximum.
 - b. Smoke Developed Rating: 450 maximum.
 - 2. Full Scale Wall Fire Test: No significant surface flaming or propagation of vertical or lateral flames when tested according to ASTM E119.
 - 3. Impact Resistance (Sample to be cured. Finish, base coat and fabric over 1 inch insulation typical of project application), ASTM E2486/E2486M:
 - a. Standard Impact Resistance - 2.83 to 5.54 J (25-49 inch-lbs.).
 - 4. Structural Performance: (Test panels 4 feet by 4 feet typical of project application): ASTM E330/E330M, no permanent deformation, delamination or deterioration for positive and negative pressures as required.
 - a. Wind Loads: Uniform pressure as indicated on Drawings.
 - 5. Water Penetration: ASTM E331, no water penetration minimum 720Pa (15psf) for windows and 300 Pa (6.24 psf) for curtain wall assembly.
 - 6. Abrasion Resistance: ASTM D968, 500 liters of sand with slight smoothing and no loss of film integrity.
 - 7. Accelerated Weathering: ASTM G90; 2000 hours with no deterioration.
 - 8. Salt Spray Resistance: ASTM B117; Withstand 300 hours with no deleterious effects.
 - 9. Water Vapor: ASTM E96/E96M; Maximum 18 grains/hour/sf..
 - 10. Absorption-Freeze-Thaw (Pre-weighed 4 inch by 8 inch specimens; 1 inch insulation, faced with finish coat cured and stored in air; tested with edges and back open), ASTM C67.
 - a. 50 Cycles: 20 hours at 9 degrees C (4 degrees F); 4-hour thaw in water.

- b. After 50 cycles; total weight gain of maximum 6.2 grams. No checking splitting, or cracking.
- C. Adhesive: Manufacturers standard product including primer compatible with sheathing.
- D. Insulation:
 - 1. Thermal Resistance: Thermal resistance (R-value), as indicated, measured by ASTM C177.
 - 2. Insulating Material: ASTM C578, as recommended by EIFS manufacturer and treated to be compatible with EIFS components. Age insulation minimum of 6 weeks before installation.
 - 3. Provide Type I Molded Expanded Polystyrene (MEPS) insulation board for Type PB systems, in sizes as required except maximum 24 X 48 inches boards, and maximum 4 inches thick.
- E. Mechanical Anchors: As recommended by EIFS manufacturer.
- F. Accessories:
 - 1. Trim, control joints, weep screed, edging, anchors, expansion joints, and other items required for proper installation as recommended by EIFS manufacturer.
 - 2. Metal Items and Fasteners: Corrosion resistant.
- G. Reinforcing Fabric: Balanced, open weave, glass fiber fabric made from twisted multi-end strands specifically treated for compatibility with the other materials of system.
 - 1. Minimum weight 4.3 oz./sq. yd..
- H. Base Coat: Manufacturer's standard.
- I. Finish Coat: Manufacturer's standard. Minimum thickness 1/16 inch, complying with performance requirements.
- J. Sealant: ASTM C920; Class 50 with 100 percent recovery. Type, grade and use as recommended by sealant manufacturer.
 - 1. When required, provide non-staining primer, bond breaker, and backer rods as recommended by sealant manufacturer.
 - 2. Do not use absorptive materials as backer rods.

2.4 UNIT FINISH

- A. Description: Reinforced gypsum board joints, skim coat and bonding coat applied directly to gypsum board sheathing ready to receive thin brick finish and grout.
- B. Joint Reinforcement:
 - 1. Reinforcing tape: Minimum 4 inches wide, polymer coated, open mesh glass fiber tape.
 - 2. Tape Embedding Material: ANSI A118.4; ready-to-mix Portland cement latex fortified mortar containing dry latex polymers.
- C. Accessories: Trim, control joints and corner beads as recommended by exterior finish system manufacturer.
- D. Brick: Kiln-fired brick approved by manufacturer for exterior use.
 - 1. Weight: Maximum 10 psf).
 - 2. Thickness: Maximum 3/4 inch.
- E. Grout: ANSI A118.6; ready-to-mix, Portland cement based latex fortified grout containing dry latex polymers.
- F. Sealant: ASTM C920; Class 50 with 100 percent recovery. Type, grade and use recommended by sealant manufacturer.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine and verify substrate suitability for product installation.
- B. Protect existing construction and completed work from damage.
- C. Notify Contracting Officer's Representative in writing of conditions detrimental to proper completion of work.
- D. Do not proceed with work until unsatisfactory conditions are corrected.

3.2 INSTALLATION - GENERAL

- A. Install products according to manufacturer's instructions and approved submittal drawings.

1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.

3.3 CONTROL JOINT INSTALLATION

- A. See drawings for location of building control joints and surface control joints.
- B. Install surface control joints as follows:
 1. Direct Exterior Finish: Install at 6 meters (20 feet maximum on center, both directions, erecting continuous vertical joints first at building expansion joints, intersection of dissimilar substrates or finishing materials where concentrated stresses or movement is anticipated. Leave 1/2 inch minimum continuous gap between board panels to receive control joint.
 2. Unit Finish: Install at 5 meters (16 feet maximum on center, both directions, or at lesser spacing as recommended by brick manufacturer, erecting continuous vertical joints first. Leave 1/2 inch minimum, continuous gap between board panels to receive control joint or sealant backer and sealant.
 3. Exterior Insulation and Finish System. Install at 15 meters (50 feet maximum in both directions and at building expansion joints, floor lines and where EIFS intersects other materials per manufacturer's recommendations.

3.4 SEALANT INSTALLATION

- A. Unit Finish: Apply sealant at intersections of gypsum board with windows, doors, control joints, other openings and locations as shown on drawings.
- B. Exterior Insulation and Finish System: Apply sealant according to EIFS manufacturer's recommendation.
- C. Do not apply sealant in locations intended for water drainage.

3.5 UNIT FINISH INSTALLATION

- A. Joint Reinforcement: Pre-fill gypsum board joints and trim with latex fortified mortar mixed according to manufacturer's instructions.
 1. Immediately embed reinforcing tape into wet mortar and tightly trowel to board surface to avoid crowning joints.

2. Cure for four hours minimum before applying skim coat.
- B. Skim Coat: Uniformly apply skim coat of latex fortified mortar a minimum of 1/8 inch thick, smooth and flat over entire surface.
 1. Dampen board surface as necessary under rapid drying conditions.
 2. Cure 24 hours minimum before applying bond coat for setting thin brick.
- C. Thin Brick:
 1. Bonding Coat:
 - a. Install according to ANSI A108.5. Apply latex fortified mortar bonding coat, using notched trowel to suit applied finish to produce minimum 3/32 inch thick mortar under installed finish.
 - b. Dampen skim coat as necessary under rapid drying conditions.
 - c. Back butter thin brick for 100 percent mortar contact.
 - d. Install tile by firmly pressing into freshly notched mortar.
Use sliding and twisting motion to embed units and obtain a 100 percent mortar contact.
 - e. Maintain joint alignment and spacing.
 - f. Beat tiles into place with beating blocks to close up grooves in mortar left by notched trowel.
 2. Grout: Apply grout according to ANSI A108.10 after tile mortar has firmly set for 24 hours.
 - a. Fill and compress joints solidly with grout and tool to provide specified appearance.
 - b. Clean any grout from finish surfaces.
 - c. Cure as required by ANSI A108.10.

3.6 EXTERIOR INSULATION AND FINISH SYSTEM INSTALLATION

- A. Insulation Board Layout: Place horizontally from level base line. Stagger vertical joints and interlock at corners. Butt joints tightly. Provide flush surfaces at joints. Offset insulation board joints from joints in sheathing minimum 8 inches. Do not align joints

with corners of doors, windows and other openings. Do not leave insulation board exposed longer than recommended by insulation manufacturer.

- B. Adhesive: Apply directly to entire back surface of the insulation board as recommended by the system manufacturer and immediately apply to gypsum board substrate. Apply firm pressure over entire board to ensure uniform contact and level surface. Allow adhesive to cure for 24 hours minimum before sanding.
- C. Create means of drainage between insulation board and gypsum board sheathing.
- D. Flash penetrations and terminations to discharge water to exterior.
- E. Mechanical Fasteners: Fasten with manufacturer's standard anchors, spaced as recommended by manufacturer, maximum 24 inches on center horizontally and vertically.
- F. Sanding: Sand entire surface of insulation before applying base coat, level high joints and remove dirt and weathering damage. Do not pre-fill low areas with basecoat.
- G. Base Coat: Trowel apply uniform thickness of base coat to insulation with minimum thickness of 1-1/2 times reinforcing fabric thickness and minimum 3/32 inches wet thickness.
- H. Install reinforcing fabric embedded in base coat. Provide diagonal reinforcement at opening corners, back wrapping, and other reinforcement recommended by EIFS manufacturer. Ensure fabric pattern is not visible beneath the surface of the basecoat after installation. Cure basecoat 24 hours minimum before applying finish coat.
- I. Finish Coat:
 - 1. Inspect basecoat for damage or defects and repair before applying finish coat.
 - 2. Trowel apply finish coat minimum 1/16 inch thick.
 - 3. Texture finish as required.
 - 4. Surface Tolerance: Maximum 1/500 (1/4 inch in 10 feet deviation from plumb and plane.

- - E N D - -

SECTION 07 27 26
FLUID-APPLIED MEMBRANE AIR BARRIERS, VAPOR PERMEABLE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Fluid-applied vapor-permeable air barrier at exterior above grade wall assemblies.
 - 2. Connection to adjacent air barrier components providing a durable, continuous, full building air barrier.

1.2 RELATED REQUIREMENTS

- A. General Quality Assurance and Quality Control Requirements: Section 01 45 29 TESTING LABORATORY SERVICES.
- B. Commissioning of building envelope components: Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS.
- C. Masonry Unit Air Barrier Substrates: Section 04 20 00 UNIT MASONRY.
- D. Membrane base flashings and stripping Requiring Air Barrier Transitions: Section 07 51 00, BUILT-UP BITUMINOUS ROOFING Section 07 52 16.13
- E. Flashing Components of Factory Finished Roofing and Wall Systems Requiring Air Barrier Transitions: Section 07 40 00 ROOFING AND SIDING PANELS.
- F. Metal Flashing Requiring Air Barrier Transitions: Section 07 60 00 FLASHING AND SHEET METAL.
- G. Joint Sealants: Section 07 92 00, JOINT SEALANTS.
- H. Exterior Wall Openings Requiring Air Barrier Transitions: Division 08 sections for aluminum-framed entrances and storefronts
- I. Wall Sheathings Air Barrier Substrates: Section 09 29 00 GYPSUM BOARD.

1.3 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. Air Barrier Association of America (ABAA):
 - 1. Quality Assurance Program.

C. ASTM International (ASTM):

1. C920-14a - Elastomeric Joint Sealants.
2. C1193-13 - Use of Joint Sealants.
3. D412-06a(2013) - Vulcanized Rubber and Thermoplastic Elastomers-Tension.
4. E96/E96M-15 - Water Vapor Transmission of Materials.
5. E162-15a - Surface Flammability of Materials Using a Radiant Heat Energy Source.
6. E783-02(2010) - Field Measurement of Air Leakage Through Installed Exterior Windows and Doors.
7. E1186-03(2009) - Air Leakage Site Detection in Building Envelopes and Air Barrier Systems.
8. E2178-13 - Air Permeance of Building Materials.
9. E2357-11 - Determining Air Leakage of Air Barrier Assemblies.

1.4 SUBMITTALS

A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

1. Show size, configuration, and fabrication and installation details.

B. Manufacturer's Literature and Data:

1. Description of each product.
2. Installation instructions.

C. Sustainable Construction Submittals:

1. Low Pollutant-Emitting Materials:
 - a. Identify volatile organic compound types and quantities.

D. Test reports:

1. Submit field inspection and test reports.

E. Certificates: Certify each product complies with specifications.

1. Compatibility: Certify products are compatible with adjacent materials.

F. Qualifications: Substantiate qualifications comply with specifications.

1. Manufacturer
2. Installer

- a. Include personnel qualifications.
 - b. Field supervisor qualifications.
 - c. Certify installer approval by air barrier manufacturer.
- G. Installation Audit:
- 1. Submit audit report.

1.5 QUALITY ASSURANCE

- A. Coordinate work with adjacent and related work to provide continuous, unbroken, durable air barrier system.
- B. Manufacturer Qualifications:
- 1. Regularly and presently manufactures specified products.
 - 2. Manufactured specified products with satisfactory service on five similar installations for minimum five years.
- C. Installer Qualifications:
- 1. Regularly and presently installs specified products.
 - 2. Approved by manufacturer.
 - 3. Applicators trained and certified by manufacturer of air barrier system.
 - 4. Full time on-site field supervisor has completed three projects of similar scope within last year.
 - 5. Field Supervisor: Holds Sealant, Waterproofing, and Restoration Institute (SWRI) Wall Coating Validation Program Certificate, or similar qualification acceptable to Contracting Officer's Representative.
- D. Testing Agency Qualifications:
- 1. Accredited by International Accreditation Service, Inc. or American Association for Laboratory Accreditation.
 - 2. Staff experienced in installation of specified system and qualified to perform observation and inspection specified and determine compliance with project requirements.

1.6 DELIVERY

- A. Deliver products in manufacturer's original sealed packaging.
- B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, production run number, and manufacture date.
- C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.7 STORAGE AND HANDLING

- A. Store products indoors in dry, weathertight, conditioned facility.
- B. Protect products from damage during handling and construction operations.

1.8 FIELD CONDITIONS

- A. Environment:
 - 1. Work Area Ambient Temperature Range: 4 to 32 degrees C (40 to 90 degrees F) continuously, beginning 48 hours before installation.
 - 2. Surface Requirements: visibly dry, and complying with manufacturer's instructions.

1.9 WARRANTY

- A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

- A. Air-Barrier Assembly Air Leakage: Maximum 0.04 cfm/sq. ft. of surface area at 75 Pa (1.57 psf) differential pressure when tested according to ASTM E2357.
- B. Full Building Air Leakage: Refer to Section 01 45 29 TESTING LABORATORY SERVICES.
- C. Provide full system of compatible materials under conditions of service and application required. Compatibility based on testing by material manufacturer.
- D. Perform as continuous vapor permeable air barrier and moisture drainage plane.
- E. Transition to adjacent flashings and discharge water to building exterior.

- F. Accommodate substrate movement and seal expansion and control joints, construction material transitions, opening transitions, penetrations, and perimeter conditions without moisture deterioration and air leakage exceeding performance requirements.

2.2 PRODUCTS - GENERAL

- A. Provide air barrier system components from one manufacturer.
- B. Sustainable Construction Requirements:
 - 1. Low Pollutant-Emitting Materials: Comply with VOC limits specified in Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS for the following products:
 - a. Non-Flooring Adhesives and Sealants.

2.3 AIR BARRIER

- A. Fluid-Applied, Vapor-Permeable Membrane Air Barrier:
 - 1. Basis of Design: Prosoco Cat-5 Air and Weather Barrier OR APPROVED ALTERNATE
 - 2. Elastomeric, modified bituminous or synthetic polymer membrane.
 - 3. Air Permeance: ASTM E2178: 0.04 cfm/sq. ft. of surface area at 75 Pa (1.57 psf) differential pressure.
 - 4. Vapor Permeance: ASTM E96/E96M: Minimum 10 perms.
 - 5. Elongation: Ultimate, ASTM D412, Die C: 200 percent, minimum.
 - 6. Thickness: Minimum 40 mils dry film thickness, applied in single continuous coat.
 - 7. Surface Burning Characteristics: When tested according to ASTM E84.
 - a. Flame Spread Rating: 25 maximum.
 - b. Smoke Developed Rating: 450 maximum.

2.4 ACCESSORIES

- A. Primer: Waterborne primer complying with VOC requirements, recommended air barrier manufacturer to suit application.
- B. Counterflashing Sheet: Modified bituminous, minimum 40 mils thick, self-adhering composite sheet consisting of minimum 33 mils of rubberized asphalt laminated to polyethylene film.
- C. Substrate Patching Material: Manufacturer's standard trowel-grade filler material.

- D. Sprayed Polyurethane Foam Sealant: Foamed-in-place, 1.5 to 2.0 pcf density, with maximum flame-spread index of 25 when tested according to ASTM E84.
- E. Flexible Opening Transition: Cured low-modulus silicone extrusion with reinforcing ribs, sized to fit opening widths, designed for adhesion to or insertion into aluminum framing extrusions, and compatible with air barrier system materials and accessories.
- F. Joint Sealant: ASTM C920, single-component, neutral-curing silicone; Class 100/50 (low modulus), Grade NS, Use NT related to exposure, approved by membrane air barrier manufacturer for adhesion and compatibility with membrane air barrier and accessories.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine and verify substrate suitability for product installation.
- B. Protect existing construction and completed work from damage.
- C. Correct substrate deficiencies:
 - 1. Remove projections and excess materials and fill voids with substrate patching material.
 - 2. Remove contaminants capable of affecting subsequently installed product's performance.
- D. Prepare and treat substrate joints and cracks according to ASTM C1193 and membrane air barrier manufacturer's instructions.

3.2 INSTALLATION - AIR BARRIER

- A. Install products according to manufacturer's instructions and approved submittal drawings.
 - 1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.
- B. Apply primer.
- C. Install transition strips and accessory materials.
- D. Seal air barrier to adjacent components of building air barrier system.

- E. Install flexible opening transition at each opening perimeter. Extend transition onto each substrate minimum 3 inches.
 - 1. Fill gaps at perimeter of openings with foam sealant.
- F. At penetrations, seal transition strips around penetrating objects with termination mastic.
 - 1. Fill gaps at perimeter of penetrations with sprayed polyurethane foam sealant.
- G. At top of through-wall flashings, seal with continuous transition strip of manufacturer's recommended material to suit application.
- H. Apply air barrier in full contact with substrate to produce continuous seal with transitions.
- I. Apply fluid membrane in thickness recommended by manufacturer, and minimum specified thickness.
- J. Leave air barrier exposed until tested and inspected and approved by Contracting Officer's Representative.

3.3 FIELD QUALITY CONTROL

- A. Field Inspections and Tests: Performed by testing laboratory specified in Section 01 45 29, TESTING LABORATORY SERVICES.
 - 1. Perform inspections and tests before concealing air barrier with subsequent work.
- B. Inspections:
 - 1. Compatibility of materials within air barrier system and adjacent materials.
 - 2. Suitability of substrate and support for air barrier.
 - 3. Suitability of conditions under which air barrier is applied.
 - 4. Adequacy of substrate priming.
 - 5. Application and treatment of joints and edges of transition strips, flexible opening transitions, and accessory materials.
 - 6. Continuity and gap-free installation of air barrier, transition strips, and accessory materials.
- C. Tests:
 - 1. Qualitative air-leakage testing according to ASTM E1186.

2. Quantitative air-leakage testing according to ASTM E783.
- D. Inspection and Test Frequency: Determined by installed air barrier surface area.
1. Up to 10,000 sq. ft.: One inspection.
 2. 10,001 - 35,000 sq. ft.: Two inspections.
 3. 35,001 - 75,000 sq. ft.: Three inspections.
 4. 75,001 - 125,000 sq. ft.: Four inspections.
 5. 125,001 - 200,000 sq. ft.: Five inspections.
 6. 200,000 sq. ft.: Six inspections.
- E. Submit inspection and test reports to Contracting Officer's Representative within seven calendar days of completing inspection and test.
- F. Defective Work:
1. Correct deficiencies, make necessary repairs, and retest as required to demonstrate compliance with specified requirements.

3.4 CLEANING

- A. Remove masking materials.
- B. Clean spills and overspray using cleaning agents recommended by manufacturers of affected construction.

3.5 PROTECTION

- A. Protect air barrier from construction operations.
- B. Protect air barrier from exposure to UV light exposure exceeding manufacturer's recommendation.
- C. Replace overexposed materials and retest.

-- E N D --

SECTION 07 31 13
ASPHALT SHINGLES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Fiberglass asphalt shingles over underlayment nailed to roof sheathing.

1.2 RELATED WORK

- A. Section 07 60 00, FLASHING AND SHEET METAL: Counterflashing and Flashing of Roof Projections.
- B. Section 07 71 00, ROOF SPECIALTIES: Roof Hatches (Scuttles) and Roof Vents.
- C. Section 09 06 00, SCHEDULE FOR FINISHES: Shingle Color.

1.3 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. ASTM International (ASTM):
- D226/D226M-17Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
- D1970/D1970M-19Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
- D3018/D3018M-11(2017).....Class A Asphalt Shingles Surfaced with Mineral Granules.
- D3161/D3161M-20Wind Resistance of Steep Slope Roofing Products (Fan-Induced Method).
- D3462/D3462M-19Asphalt Shingles Made from Glass Felt and Surfaced with Mineral Granules.
- F1667-18aDriven Fasteners: Nails, Spikes, and Staples.
- C. UL LLC (UL):
- 790(Edition 8).....Fire Tests of Roof Coverings.

1.4 SUBMITTALS

- A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

- B. Manufacturer's Literature and Data:
 - 1. Description of each product.
 - 2. Installation instructions.
 - 3. Warranty.
- C. Samples: Shingles: Full size each type, color and texture.
- D. Sustainable Construction Submittals:
 - 1. Solar Reflectance Index (SRI) for asphalt shingles.

1.5 DELIVERY

- A. Deliver products in manufacturer's original sealed packaging.
- B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, color, production run number, manufacture date, and the label of Underwriters Laboratories.
- C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.6 STORAGE AND HANDLING

- A. Store shingles according to manufacturer's instructions. Store roll goods on end in upright position.
- B. Protect products from damage during handling and construction operations.
- C. Keep materials dry, covered completely and protected from weather.

1.7 WARRANTY

- A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."
- B. Manufacturer's Warranty: Warrant asphalt shingles against material and manufacturing defects.
 - 1. Material Warranty Period: 35 years.
 - 2. Wind-Speed Warranty Period: Resist wind speeds up to 60 mph for 5 years.
 - 3. Algae-Resistance Warranty Period: No discoloration for 15 years.

PART 2 - PRODUCTS

2.1 PRODUCTS - GENERAL

- A. Basis of Design: Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Provide each product from one manufacturer.

1. Provide each product exposed to view from one production run.
- C. Sustainable Construction Requirements:
1. Asphalt Shingle Recycled Content: 50 percent post-consumer recycled content, minimum.
 2. Solar Reflectance Index: 29, minimum.

2.2 ASPHALT SHINGLES

- A. Asphalt Shingles: Fiberglass reinforced, laminated type, square butt.
1. ASTM D3462/D3462M and ASTM D3018/D3018M, Type I, self-sealing.
 2. ASTM D3161/D3161M, Class D or F wind-resistant.
 3. UL 790 Class A fire resistance.
 4. Minimum Weight: 210 lbs./100 square feet.

2.3 ROOFING NAILS

- A. ASTM F1667, Type I, Style 20, galvanized steel, deformed shanks, heads 3/8 inch to 7/16 inch diameter.
1. Nails for Shingles: 1-1/4 inches long.
 2. Nails for Felt: 3/4 inch long.

2.4 ROOFING UNDERLAYMENT

- A. Organic Felt: ASTM D226/D226M, Type I.
- B. Self-Adhering Modified Bituminous Underlayment: ASTM D1970/D1970M.

2.5 METAL FLASHING

- A. Provide metal roof flashings, including apron flashings, step flashings, valley flashings, drip edges, and vent pipe flashings specified in Section 07 60 00, FLASHING AND SHEET METAL.

2.6 RIDGE VENTS

- A. Ridge Vents: Manufacturer's standard ridge vent for use under asphalt shingles.
1. Provide ridge vents with internal filters, internal baffles, or external baffles, for weather protection.
 2. Free Area: Minimum 12 square inches per foot.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine and verify substrate suitability for roofing installation.
 - 1. Verify roof substrates are sound, within manufacturer's tolerances, and free from defects which would interfere with roofing installation.
 - 2. Verify roof accessories, vent pipes and other projections through roof are in place and roof flashing is installed, or ready for installation, before installing shingles.
- B. Protect existing construction and completed work from damage.

3.2 INSTALLATION - GENERAL

- A. Install products according to manufacturer's instructions and approved submittal drawings.
 - 1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.

3.3 METAL DRIP EDGE INSTALLATION

- A. At eaves and rakes, install stainless steel drip edges specified in Section 07 60 00, FLASHING AND SHEET METAL.
 - 1. Eaves: Install metal drip edge before underlayment.
 - 2. Rakes: Install metal drip edge after underlayment.
- B. Secure metal drip edges with compatible nails spaced maximum 10 inches on center along inner edges.

3.4 FLASHING INSTALLATION

- A. Install metal flashings specified in Section 07 60 00, FLASHING AND SHEET METAL at intersections of roofs, adjoining walls, or projections through deck such as chimneys and vent stacks.
- B. Install metal valley flashing shown and as specified under Section 07 60 00, FLASHING AND SHEET METAL.
 - 1. Secure valley flashing according to shingle manufacturer's instructions.
 - 2. Expose flashing in open portion of valley 5 inches minimum, and lap shingles over flashing 5 inches minimum.

3.5 UNDERLAYMENT INSTALLATION

- A. Install self-adhering sheet underlayment, working from low point to high point. Lap sides 3-1/2 inches minimum, and lap ends 6 inches minimum. Install at the following locations:
 - 1. Eaves and Rakes: From edge of eave and rake to 24 inches minimum beyond inside face of exterior wall.
 - a. Lap underlayment over eave metal drip edge.
 - 2. Valleys, Hips and Roof Slope Transitions: Centered over change in slope, and extended 18 inches minimum on both sides.
 - 3. Ridges: Centered on ridge, and extended 36 inches minimum on both sides. Do not cover ridge vent opening.
 - 4. Sidewalls and Projections through Roof: Extended 18 inches from projection, and extended up projection 4 inches minimum.
 - 5. Firmly roll underlayment to ensure adhesion to roof deck and metal flashings.
- B. Install organic felt underlayment on roof deck not covered by self-adhering sheet underlayment, with 4 inches minimum end laps, 2 inches minimum head laps, and 12 inches minimum ridge laps. Nail felt 5 inches on centers along laps.

3.6 ROOF ACCESSORY INSTALLATION

- A. Install roof hatches (scuttles), and roof vents, specified in Section 07 71 00, ROOF SPECIALTIES before installing shingles.
- B. Install skylights specified in Section 08 63 00, METAL-FRAMED SKYLIGHTS before installing shingles.
- C. Lap underlayment and asphalt shingles over upslope base flanges of roof accessory flashings.
- D. Install underlayment and asphalt shingles over side slope base flanges of roof accessory flashings.
- E. Install downslope base flanges of roof accessories over asphalt shingles.

3.7 ASPHALT SHINGLE INSTALLATION

- A. Install shingles aligned parallel to roof eave, nailed to roof sheathing.

1. Exposure: 5 inches maximum.
2. Head lap: 2 inches minimum.
- B. Install asphalt-shingle starter strip with tabs removed, and overhanging lower edge of roof 1/2 inch.
- C. Valleys: Open

3.8 RIDGE VENT INSTALLATION

- A. Install ridge vents over shingles.
 1. Extent: Continuous along ridges extending to within <distance> of rakes.

3.9 HIP AND RIDGE SHINGLE INSTALLATION

- A. Bend each shingle lengthwise down center to provide equal exposure on both sides of hip and ridge.
 1. Begin ridge installation at leeward end of ridge. Cover ridge vents with shingles. Do not cover ridge vent openings with ridge shingles.
 2. Begin hip installation at eave.
- B. Install shingles with maximum 5 inches exposure.
- C. Secure each shingle with one nail on both sides of hip and ridge, 8-1/2 inches back from exposed end and one inch up from edge.

3.10 SNOW GUARD INSTALLATION

- A. Install snow guards in layout recommended by manufacturer.
 1. Fasten snow guards with fasteners concealed by shingles.

-- E N D --

SECTION 07 40 00
ROOFING AND SIDING PANELS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies metal wall panels as shown on contract documents.

1.2 RELATED WORK

- A. Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS: Sustainable Design Requirements.
- B. Section 07 92 00, JOINT SEALANTS: Sealant.
- C. Section 09 06 00, SCHEDULE FOR FINISHES: Color and texture of finish.

1.3 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Provide and composite metal wall systems products of a manufacturer regularly engaged for not less than five (5) years in the fabrication of metal panels of the type and design indicated.
- B. Installer: A firm with three (3) years of successful experience with installation of roofing and siding panels of type and scope equivalent to Work of this Section. Submit installer qualifications.

1.4 FIRE RATING

- A. Composite metal wall systems to have a fire rating of 2 hours when tested in accordance with ASTM E119.

1.5 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Sustainable Design Submittals, as described below:
 - 1. Postconsumer recycled content as specified in PART 2 - PRODUCTS.
- C. Samples: Metal panel, 152 mm (6 inch) square, showing finish, each color and texture.
- D. Shop Drawings: Wall panels, showing details of construction and installation.
- E. Manufacturer's Literature and Data: Wall panels

- F. Fire Test Report: Report of fire test by recognized testing laboratory for fire rating specified, showing details of construction.
- G. Manufacturer's Certificates: Indicating manufacturer's qualifications specified.
- H. Installer qualifications.
- I. Manufacturer warranty.

1.6 QUALITY ASSURANCE

- A. Approval by Contracting Officer Representative (COR) is required of products of proposed manufacturer.
- B. Certify manufacturer has five (5) years continuous documented experience in fabrication of metal roofing and siding panels.
- C. Source: For each material type required for work of this section, provide primary materials, which are products of one manufacturer. Provide secondary or accessory materials, which are acceptable to manufacturers of primary materials.
- D. Installer: A firm with a minimum of three (3) years' experience in type of work required by this section and which is acceptable to manufacturers of primary materials.

1.7 WARRANTY

- A. Construction Warranty: Comply with FAR clause 52.246-21 "Warranty of Construction".
- B. Manufacturer Warranty: Manufacturer shall warranty their metal wall panels for a minimum of ten (10) years from the date of installation and final acceptance by the Government. Submit manufacturer warranty.
- C. Warranty on Panel Finishes: Manufacturer's shall warrant their wall panel finish and provide standard agreement to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when testing according to ASTM D4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: 20 years from date of installation and final acceptance by the COR.

1.8 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extend referenced.
The publications are referenced in the text by the basic designation only.
- B. American Architecture Manufacturers Association (AAMA):
- 611-14..... Anodized Architectural Aluminum
- 621-02..... Voluntary Specifications for High Performance Organic
Coatings on Coil Coated Architectural Hot Dipped
Galvanized (HDG) and Zinc-Aluminum Coated Steel
Substrates
- 2605-13..... Voluntary Specification, Performance Requirements and
Test Procedures for Superior Performing Organic Coatings
on Aluminum Extrusions and Panels
- C. American Iron and Steel Institute (AISI):
- SG03-02 Cold-Formed Steel Design Manual
- D. ASTM International (ASTM):
- A463/A463M-15 Steel Sheet, Cold-Rolled, Aluminum-Coated, by the Hot-
Dip Process
- A653/A653M-20 Steel Sheet, Zinc-Coated (Galvanized), or Zinc-Iron Alloy-
Coated (Galvannealed) by the Hot-Dip Process.
- A924/A924M-19 Steel Sheet, Metallic Coated by the Hot-Dip Process
- A1008/A1008M-18 Steel, Sheet, Cold-Rolled, Carbon, Structural, High
Strength Low Alloy
- B209-14 Aluminum and Aluminum Alloy Sheet and Plate
- B209M-14 Aluminum and Aluminum Alloy Sheet and Plate (Metric)
- C553-19..... Mineral Fiber Blanket Thermal Insulation for Commercial
and Industrial Applications
- C591-20. Unfaced Preformed Rigid Cellular Polyisocyanurate
Thermal Insulation
- C612-14(2019) Mineral Fiber Block and Board Thermal Insulation

- C1396/C1396M-17 Gypsum Board
- D2244-16 Calculation of Color Tolerances and Color Differences
from Instrumentally Measured Color Coordinates
- D4214-07(2015)..... Test Methods for Evaluating the Degree of Chalking of
Exterior Paint Films
- E119-20..... Fire Test of Building Construction and Materials
- E283-19..... Test Method for Determining Rate of Air Leakage Through
Exterior Windows, Curtain Walls, and Doors Under
Specified Pressure Differences Across the Specimen
- E331-00(2016) Test Method for Water Penetration of Exterior Windows,
Skylight, Doors, and Curtain Walls by Uniform Static Air
Pressure Difference
- E1592-05(2017) Standard Test Method for Structural Performance of
Sheet Metal Roof and Siding Systems by Uniform Static
Air Pressure Method
- E1646-95(2018) Test Method for Water Penetration of Exterior Metal
Roof Panel Systems by Uniform Static Air Pressure
Difference
- E1680-16..... Test Method for Rate of Air Leakage Through Exterior
Metal Roof Panel Systems
- E1980-11(2019) Calculating Solar Reflectance Index of Horizontal and Low-
Sloped Opaque Surfaces
- E2140-01(2017) Test Method for Water Penetration of Metal Roof Panel
Systems by Static Water Pressure Head
- E. Cool Roof Rating Council (CRRC):
Standard-14
- F. FM Global:
4471-10..... Class 1 Panel Roofs
- G. Underwriters Laboratories (UL):

580-05(R2018) Tests for Uplift Resistance of Roof Assemblies Fire
Resistance Directory

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS FOR WALL PANELS

- A. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E1592.
 - 1. Wind Loads: As indicated.
 - 2. Other Design Loads: As indicated.
 - 3. Deflection Limits: For wind loads, no greater than 1/240 of the span.
 - 4. Panel width: 12 inches
- B. Air Infiltration: Air leakage of not more than 0.3 liter/second per square meter (0.06 cfm/square foot) when tested according to ASTM E283 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 75 Pa (1.57 pound/square foot)
- C. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E331 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 137 Pa (2.86 pound force/square foot)
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joints sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 67 degrees C (120 degrees F), ambient; 100 degrees C (180 degrees F), material surfaces.
- E. Fire-Resistance Ratings: Comply with ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Indicate design designations from UL's Fire Directory or from the listings of another qualified testing agency.

2.2 ALUMINUM PLATE AND SHEET

- A. ASTM B209M (B209).

2.3 FASTENERS

- A. Fasteners for Aluminum Panels to be aluminum or stainless steel.

2.4 GYPSUM BACKING BOARD

- A. ASTM C1396/C1396M, Type X, Plain face, Square edge.

2.5 THERMAL INSULATING MATERIALS

- A. Urethane or Isocyanurate Board: ASTM C591, Type I.
- B. Mineral Fiber Blankets: ASTM C553, Type I.
- C. Mineral Fiber Board: ASTM C612, Class I.

2.6 FABRICATION

- A. General:
 - 1. Furnish panels in one continuous length for full height, or at least one story height for wall panels with no horizontal joints, except at cut-outs or openings as required for the passage of pipes, conduits, vents and the like.
 - 2. Construct panels by pressing members together to form a structural unit with closed ends.
 - 3. Overall thickness of panels is shown of the contract documents.
 - 4. Provide connection between panels by interlocking male and female joints. Seal joints between related components as required to make the work water-tight. Refer to Section 07 92 00, JOINT SEALANTS for sealing compounds.
- B. Composite Metal Wall Systems:
 - 1. Panels consisting of an exterior face sheet, sub-girts, gypsum backing board panels, insulation, and interior liner sheet.
 - 2. Panel Composition:
 - a. Exterior face sheet of 0.9 mm (0.0359 inch) thick sheet steel of indicated configuration and pattern.
 - b. Gypsum backing board used for wall panels to be of the same type for each layer.

- c. Interior liner sheet of 0.7 mm (0.0276 inch) thick galvanized sheet steel of flush pattern.
- d. Insulation to be mineral fiber blankets installed on interior face of liner sheet.
- C. Fabricate wall louvers and frames used in conjunction with walls panels to be of same material, thickness and finish as exterior face sheets of wall system. Louver assembly to be designed and installed to prevent infiltration of water into structure.

2.7 FINISH

- A. For insulated and uninsulated wall and roof panels and composite wall and roof panels , provide finishes as follows for face sheets. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
- B. Provide aluminum alloy for color coating as required to produce specified color.
Provide color as specified in Section 09 06 00, SCHEDULE FOR FINISHES. Color for sheet aluminum to not deviate more than the colors of extrusion samples.
 - 1. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install panels in accordance with the manufacturer's approved erection instructions and diagrams, except as specified otherwise.
- B. Install panels in full and firm contact with supports and with each other at side and end laps.
- C. Where panels are cut in the field, or where factory applied coverings or coatings are abraded or damaged in handling or installation, make finish repairs with material of the same type and color as the weather coating, before being installed.
- D. Seal cut ends and edges, including those at openings through the sheets.
- E. Correct defects or errors in the materials in a manner approved by the COR.
- F. Replace defective materials which cannot be corrected with nondefective material.

- G. Provide molded closure strips where indicated and whenever sheets terminate with open ends after installation.
- H. Wall Panels:
 - 1. Apply panels with the configuration in a vertical position.
 - 2. Provide panels in the longest obtainable lengths, with end laps occurring only at structural members
 - 3. Seal side and end laps with joint sealing material.
 - 4. Flash and seal walls at the base, at the top, around windows, door frames, framed louvers, and other similar openings. Install closure strips, flashings, and sealing material in an approved manner that will assure complete weather tightness.
 - 5. Flashing is not required where approved "self-flashing" panels are used.
- I. Flashing:
 - 1. Provide flashing and related closures and accessories in connection with the preformed metal panels as indicated and as necessary to provide a watertight installation.
 - 2. Install details of installation, which are not indicated, in accordance with the panel manufacturer's printed instruction and details, or the approved shop drawings.
 - 3. Allow for expansion and contraction of flashing.
- J. Fasteners:
 - 1. Space fasteners in accordance with the manufacturer's recommendations, and as necessary to withstand the design loads indicated.
 - 2. Install fasteners in valleys or crowns as recommended by the manufacturer of the panel being used.
 - 3. Install fasteners in straight lines within a tolerance of 13 mm (1/2-inch) in the length of a bay.
 - 4. Drive exposed penetrating type fasteners normal to the surface, and to a uniform depth to seat gasketed washers properly, and drive so as not to damage factory applied coating.

5. Exercise care in drilling pilot holes for fastenings to keep drills perpendicular and centered in valleys, or crowns, as applicable. After drilling, remove metal filings and burrs from holes prior to installing fasteners and washers. Do not torque fasteners to exceed values recommended by the manufacturer.
6. Remove panels deformed or otherwise damaged by over-torqued fastenings, and provide new panels.
7. Remove metal shavings and filings from roofs on completion to prevent rusting and discoloration of the panels.

3.2 ISOLATION OF ALUMINUM

- A. Isolate aluminum in contact with or fastened to dissimilar metals other than stainless steel, white bronze, or other metal compatible with aluminum by one of the following:
 1. Painting the dissimilar metal with a prime coat of Zinc-Molybdate followed by two coats of aluminum paint.
 2. Placing a non-abrasive tape or gasket between the aluminum and the dissimilar metal.
- B. Paint aluminum in contact with, or built into mortar, concrete, plaster, or other masonry materials with a coat of alkali-resistant bituminous paint.
- C. Paint aluminum in contact with wood or other absorptive materials that may become repeatedly wet, with two coats of bituminous paint, or two coats of aluminum paint.
Seal joints with caulking material.

3.3 PROTECTION AND CLEANING

- A. Protect panels and other components from damage during and after erection, and until project is accepted by the COR.
- B. After completion of work, all exposed finished surfaces of panels are to be cleaned of soil, discoloration and disfiguration. Touch-up abraded surfaces of panels.

- - - E N D - - -

SECTION 07 54 23
THERMOPLASTIC POLYOLEFIN (TPO) ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Thermoplastic Polyolefin (TPO) sheet roofing adhered to roof deck.

1.2 RELATED WORK

- A. Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS: Non-Flooring Adhesives and Sealants VOC Limits.
- B. Section 07 01 50.19, PREPARATION FOR REROOFING: Preparation of Existing Membrane Roofs and Repair Areas.
- C. Section 07 22 00, ROOF AND DECK INSULATION: Roof Insulation.

1.3 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. American National Standards Institute/Single-Ply Roofing Institute (ANSI/SPRI):
FX-1-16Standard Field Test Procedure for Determining the
Withdrawal Resistance of Roofing Fasteners.
- C. American Society of Civil Engineers/Structural Engineering Institute (ASCE/SEI):
7-16Minimum Design Loads for Buildings and Other Structures.
- D. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
(ASHRAE):
90.1-13Energy Standard for Buildings Except Low-Rise Residential
Buildings.
- E. ASTM International (ASTM):
C67-20Sampling and Testing Brick and Structural Clay Tile.
C140/C140M-20aSampling and Testing Concrete Masonry Units and Related
Units.
C1371-15Determination of Emittance of Materials Near Room
Temperature Using Portable Emissometers.

- C1549-16Determination of Solar Reflectance Near Ambient
Temperature Using a Portable Solar Reflectometer.
- D1876-08(2015)e1Peel Resistance of Adhesives (T-Peel Test).
- D4263-83(2018)Indicating Moisture in Concrete by the Plastic Sheet
Method.
- D4434/D4434M-15Poly(Vinyl Chloride) Sheet Roofing.
- D6878/D6878M-13Thermoplastic Polyolefin Based Sheet Roofing.
- E408-13Total Normal Emittance of Surfaces Using
Inspection-Meter Techniques.
- E1918-16Measuring Solar Reflectance of Horizontal and Low-Sloped
Surfaces in the Field.
- E1980-11(2019).....Calculating Solar Reflectance Index of Horizontal and
Low-Sloped Opaque Surfaces.
- F. Cool Roof Rating Council (CRRC):
- 1-20Product Rating Program.
- G. National Roofing Contractors Association (NRCA):
- Manual-19.....The NRCA Roofing Manual: Membrane Roofing Systems.
- H. U.S. Department of Agriculture (USDA):
- BioPreferred® Program Catalog.
- I. UL LLC (UL):
- 580-06Tests for Uplift Resistance of Roof Assemblies.
- 1897-20Uplift Tests for Roof Covering Systems.
- J. U.S. Department of Commerce National Institute of Standards and Technology (NIST):
- DOC PS 1-19Structural Plywood.
- DOC PS 2-18Performance Standard for Wood-Based Structural-Use
Panels.
- K. U.S. Environmental Protection Agency (EPA):
- Energy StarENERGY STAR Program Requirements for Roof Products
Version 3.0.

1.4 PREINSTALLATION MEETINGS

- A. Conduct pre-installation meeting at project site minimum 30 days before beginning Work of this section.
 - 1. Required Participants:
 - a. Contracting Officer's Representative.
 - b. Architect/Engineer.
 - c. Contractor.
 - d. Installer.
 - e. Manufacturer's field representative.
 - 2. Meeting Agenda: Distribute agenda to participants minimum 3 days before meeting.
 - a. Installation schedule.
 - b. Installation sequence.
 - c. Preparatory work.
 - d. Protection before, during, and after installation.
 - e. Installation.
 - f. Terminations.
 - g. Transitions and connections to other work.
 - h. Inspecting and testing.
 - i. Other items affecting successful completion.
 - j. Pullout test of fasteners.
 - k. Material storage, including roof deck load limitations.
 - 3. Document and distribute meeting minutes to participants to record decisions affecting installation.

1.5 SUBMITTALS

- A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Submittal Drawings:
 - 1. Roof membrane layout.
 - 2. Roofing membrane fastener pattern and spacing.

3. Roofing membrane seaming and joint details.
 4. Roof membrane penetration details.
 5. Base flashing and termination details.
 6. Paver layout.
 7. Paver anchoring locations and details.
- C. Manufacturer's Literature and Data:
1. Description of each product.
 2. Minimum fastener pullout resistance.
 3. Installation instructions.
 4. Warranty.
- D. Samples:
1. Roofing Membrane: 6 inch square.
 2. Base Flashing: 6 inch square.
 3. Fasteners: Each type.
 4. Roofing Membrane Seam: 12 inches square.
- E. Sustainable Construction Submittals:
1. Solar Reflectance Index (SRI) for roofing membrane.
 2. Biobased Content:
 - a. Show type and quantity for each product.
 3. Low Pollutant-Emitting Materials:
 - a. Show volatile organic compound types and quantities.
 4. Energy Star label for roofing membrane.
- F. Certificates: Certify products comply with specifications.
1. Fire and windstorm classification.
 2. Energy performance requirements.
- G. Qualifications: Substantiate qualifications comply with specifications.
1. Installer, including supervisors with project experience list.
 2. Manufacturer's field representative with project experience list.
- H. Field quality control reports.

- I. Temporary protection plan. Include list of proposed temporary materials.
- J. Operation and Maintenance Data:
 - 1. Maintenance instructions.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Approved by roofing system manufacturer as installer for roofing system with specified warranty.
 - 2. Regularly installs specified products.
 - 3. Installed specified products with satisfactory service on five similar installations for minimum five years.
 - a. Project Experience List: Provide contact names and addresses for completed projects.
 - 4. Employs full-time supervisors experienced installing specified system and able to communicate with Contracting Officer's Representative and installer's personnel.
- B. Manufacturer's Field Representative:
 - 1. Manufacturer's full-time technical employee or independent roofing inspector.
 - 2. Individual certified by Roof Consultants Institute as Registered Roof Observer.

1.7 DELIVERY

- A. Deliver products in manufacturer's original sealed packaging.
- B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, and manufacture date.
- C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.8 STORAGE AND HANDLING

- A. Comply with NRCA Manual storage and handling requirements.
- B. Store products indoors in dry, weathertight facility.
- C. Store adhesives according to manufacturer's instructions.
- D. Protect products from damage during handling and construction operations.

- E. Products stored on the roof deck must not cause permanent deck deflection.

1.9 FIELD CONDITIONS

A. Environment:

1. Product Temperature: Minimum 4 degrees C (40 degrees F) for minimum 48 hours before installation.
2. Weather Limitations: Install roofing only during dry current and forecasted weather conditions.

1.10 WARRANTY

- A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."
- B. Manufacturer's Warranty: Warrant roofing system against material and manufacturing defects and agree to repair any leak caused by a defect in the roofing system materials or workmanship of the installer.
 1. Warranty Period: 10 years.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Roofing System: Thermoplastic Polyolefin (TPO) sheet roofing adhered to roof deck.

2.2 SYSTEM PERFORMANCE

- A. Design roofing system complying with specified performance:
 1. Load Resistance: ASCE/SEI 7; Design criteria: as indicated on Drawings.
 2. Roof Coverings and Roof Deck Assemblies:
 - A. Roof coverings shall be approved or listed by a nationally recognized testing laboratory for compliance with UL standard 790 and shall be Class B minimum.
 3. Roof deck assemblies shall be FM Class I approved, or shall be UL listed as Fire-Classified.
 4. Roof Access: Comply with IBC
 5. Energy Performance:
 - a. EPA Energy Star Listed for low-slope roof products.

- b. Three-Year Aged Performance: Minimum 0.55 solar reflectance tested in according to ASTM C1549 or ASTM E1918, and minimum 0.75 thermal emittance tested in according to ASTM C1371 or ASTM E408.
 - 1) Where tested aged values are not available:
 - a) Calculate compliance adjusting initial solar reflectance according to ASHRAE 90.1.
 - b) Provide roofing system with minimum 64 three-year aged Solar Reflectance Index calculated according to ASTM E1980 with 12 W/square meter/degree K (2.1 BTU/hour/square foot convection coefficient.

2.3 PRODUCTS - GENERAL

- A. Provide roof system components from one manufacturer.
- B. Sustainable Construction Requirements:
 - 1. Solar Reflectance Index: 78 minimum.
 - 2. Biobased Content: Where applicable, provide products designated by USDA and meeting or exceeding USDA recommendations for bio-based content, and products meeting Rapidly Renewable Materials and certified sustainable wood content definitions; refer to www.biopreferred.gov.
 - 3. Low Pollutant-Emitting Materials: Comply with VOC limits specified in Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS for the following products:
 - a. Non-flooring adhesives and sealants.

2.4 TPO ROOFING MEMBRANE

- 1. TPO Sheet: ASTM D6878/D6878M, internally fabric or scrim reinforced, 60 mils thick, with no backing.

2.5 MEMBRANE ACCESSORY MATERIALS

- A. Sheet Flashing: Manufacturer's standard sheet flashing of same material, type, reinforcement, thickness, and color as TPO sheet membrane.
- B. Factory Formed Flashings: Inside and outside corners, pipe boots, and other special flashing shapes to minimize field fabrication.
- C. Bonding Adhesive: Manufacturer's standard, water based.

- D. Metal Termination Bars: Manufacturer's standard, stainless-steel or aluminum, 25 mm wide by 3 mm thick (1-inch wide by 1/8 inch thick) factory drilled for fasteners.
- E. Battens: Manufacturer's standard, galvanized or galvanized steel sheet, 25 mm wide by 1.3 mm thick (1-inch wide by 0.05 inch thick), factory punched for fasteners.
- F. Fasteners: Manufacturer's standard coated steel with metal or plastic plates, to suit application.
- G. Primers, Sealers, T-Joint Covers, Lap Sealants, and Termination Reglets: As specified by roof membrane manufacturer.
- H. Adhesive and sealant materials recommended by roofing system manufacturer for intended use, identical to materials utilized in approved listed roofing system, and compatible with roofing membrane.

2.6 WALKWAY PADS

- A. Manufacturer's standard, slip-resistant rolls, minimum 3 feet wide by 3/16 inch thick.

2.7 ACCESSORIES

- A. Temporary Protection Materials:
 - 1. Expanded Polystyrene (EPS) Insulation: ASTM C578.
 - 2. Plywood: NIST DOC PS 1, Grade CD Exposure 1.
 - 3. Oriented Strand Board (OSB): NIST DOC PS 2, Exposure 1.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine and verify substrate suitability with roofing Installer and roofing inspector present.
 - 1. Verify roof penetrations are complete, secured against movement, and firestopped.
 - 2. Verify roof deck is adequately secured to resist wind uplift.
 - 3. Verify roof deck is clean, dry, and in-plane ready to receive roofing system.
- B. Correct unsatisfactory conditions before beginning roofing work.

3.2 PREPARATION

- A. Complete roof deck construction before beginning roofing work:

1. Curbs, blocking, edge strips, nailers, cants, and other components to which insulation, roofing, and base flashing is attached in place ready to receive insulation and roofing.
 2. Coordinate roofing membrane installation with flashing work and roof insulation work so insulation and flashing are installed concurrently to permit continuous roofing operations.
 3. Complete installation of flashing, insulation, and roofing in same day except for the area where temporary protection is required when work is stopped for inclement weather or end of work day.
- B. Dry out surfaces that become wet from any cause during progress of the work before roofing work is resumed. Apply materials to dry substrates, only.
- C. Broom clean roof decks. Remove dust, dirt and debris.
- D. Remove projections capable of damaging roofing materials.
- E. Concrete Decks, except Insulating Concrete:
1. Test concrete decks for moisture according to ASTM D4263 before installing roofing materials.
 2. Prime concrete decks. Keep primer back 4 inches from precast concrete deck joints.
 3. Allow primer to dry before application of bitumen.
- F. Insulating Concrete Decks:
1. Allow to dry out minimum five days after installation before installing roofing materials.
 2. Allow additional drying time when precipitation occurs before installing roofing materials.
- G. Poured Gypsum Decks: Dry out poured gypsum according to manufacturer's instructions before installing roofing materials.

3.3 TEMPORARY PROTECTION

- A. Install temporary protection consisting of a temporary seal and water cut-offs at the end of each day's work and when work is halted for an indefinite period or work is stopped when precipitation is imminent.

- B. Install temporary cap flashing over top of base flashings where permanent flashings are not in place to protect against water intrusion into roofing system. Securely anchor in place to prevent blow off and damage by construction activities.
- C. Temporarily seal exposed insulation surfaces within roofing membrane.
 - 1. Apply temporary seal and water cut off by extending roofing membrane beyond insulation and securely embedding edge of the roofing membrane in 1/4 inch thick by 2 inches wide strip of temporary closure sealant. Weight roofing membrane edge with sandbags, to prevent displacement; space sandbags maximum 8 feet on center.
 - 2. Direct water away from work. Provide drainage, preventing water accumulation.
 - 3. Check daily to ensure temporary seal remains watertight. Reseal open areas and weight down.
- D. Before the work resumes, cut off and discard portions of roof membrane in contact with temporary seal.
 - 1. Cut minimum 6 inches back from sealed edges and surfaces.
- E. Remove sandbags and store for reuse.

3.4 INSTALLATION - GENERAL

- A. Install products according to manufacturer's instructions and approved submittal drawings.
 - 1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.
- B. Comply with NRCA Manual installation requirements.
- C. Comply with UL 580 for uplift resistance.
- D. Do not allow membrane and flashing to contact surfaces contaminated with asphalt, coal tar, oil, grease, or other substances incompatible with TPO.

3.5 ROOFING INSTALLATION

- A. Install the membrane so the sheets run perpendicular to the long dimension of the insulation boards.
- B. Begin installation at the low point of the roof and work towards the high point. Lap membrane shingled in water flow direction.

- C. Position the membrane free of buckles and wrinkles.
- D. Roll membrane out; inspect for defects as membrane is unrolled. Remove defective areas:
 - 1. Lap edges and ends of sheets 2 inches or more as recommended by the manufacturer.
 - 2. Heat weld laps. Apply pressure as required. Seam strength of laps as required by ASTM D4434/D4434M.
 - 3. Check seams to ensure continuous adhesion and correct defects.
 - 4. Finish seam edges with beveled bead of lap sealant.
 - 5. Finish seams same day as membrane is installed.
 - 6. Anchor membrane perimeter to roof deck or parapet wall as indicated on drawings.
 - 7. Repair areas of welded seams where samples have been taken or marginal welds, bond voids, or skips occurs.
 - 8. Repair fishmouths and wrinkles by cutting to lay flat and installing patch over cut area extending 4 inches beyond cut.
- E. Membrane Perimeter Anchorage:
 - 1. Install batten at perimeter of each roof area, curb flashing, expansion joints and similar penetrations on top of roof membrane as indicated on drawings.
 - 2. Mechanically Fastening:
 - a. Space fasteners maximum 12 inches on center, starting 1 inch from ends.
 - b. When battens are cut, round edges and corners before installing.
 - c. After mechanically fastening strip cover and seal strip with a 6 inch wide roof membrane strip; heat weld to roof membrane and seal edges.
 - d. At fascia-cants turn roofing membrane down over front edge of the blocking, cant, or nailer. Secure roofing membrane to vertical portion of nailer; or, if required by the membrane manufacturer, with fasteners spaced maximum 6 inches on centers.

- e. At parapet walls intersecting building walls and curbs, secure roofing membrane to structural deck with fasteners 6 inches on centers or as shown in NRCA manual.

F. Adhered System:

1. Apply bonding adhesive in quantities required by roof membrane manufacturer.
2. Fold sheet back on itself, clean and coat the bottom side of the membrane and the top of substrate with adhesive. Do not coat the lap joint area.
3. After adhesive has set according to adhesive manufacturer's instruction, roll roofing membrane into adhesive minimizing voids and wrinkles.
4. Repeat for other half of sheet.

3.6 FLASHING INSTALLATION

- A. Install flashings same day as roofing membrane is installed. When flashing cannot be completely installed in one day, complete installation until flashing is watertight and provide temporary covers or seals.

B. Flashing Roof Drains:

1. Install roof drain flashing as recommended by roofing membrane manufacturer.
 - a. Coordinate to set the metal drain flashing in asphalt roof cement, holding cement back from the edge of the metal flange.
 - b. Do not allow the roof cement to come in contact with TPO roofing membrane.
 - c. Adhere roofing membrane to metal flashing with bonding adhesive.
2. Turn down the metal drain flashing and roofing membrane into drain body. Install clamping ring and strainer.

C. Installing Base Flashing and Pipe Flashing:

1. Install flashing sheet to pipes, wall or curbs to minimum 8 inches above roof surfaces and extending roofing manufacturer's standard lap dimension onto roofing membranes.
 - a. Adhere flashing with bonding adhesive.
 - b. Form inside and outside corners of flashing sheet according to NRCA manual.
Form pipe flashing according to NRCA manual.

- c. Lap ends roofing manufacturer's standard dimension.
 - d. Heat weld flashing membranes together and flashing membranes to roofing membranes. Finish exposed edges with lap sealant.
 - e. Install flashing membranes according to NRCA manual.
- 2. Anchor top of flashing to walls and curbs with fasteners spaced maximum 6 inches on center. Use surface mounted fastening strip with sealant on ducts. Use pipe clamps on pipes or other round penetrations.
- 3. Apply sealant to top edge of flashing.
- D. Installing Building Expansion Joints:
 - 1. Install base flashing on curbs as specified.
 - 2. Coordinate installation with metal expansion joint cover.
 - 3. Install flexible tubing 1-1/2 times the width of joint centered over joint. Cover tubing with flashing sheet adhered to base flashing and lapping base flashing roofing manufacturer's standard dimension. Finish edges of laps with sealant.
- E. Repairs to Membrane and Flashings:
 - 1. Remove sections of roofing membrane or flashing that are creased, wrinkled, or fishmouthed.
 - 2. Cover removed areas, cuts and damaged areas with a patch extending 4 inches beyond damaged, cut, or removed area. Heat weld to roofing membrane or flashing sheet. Finish edge of lap with lap sealant.

3.7 WALKWAY PAD INSTALLATION

- A. Heat weld walkway sheet to roofing membrane at edges. Weld area 2 inches wide by the entire length of the walkway sheet.
- B. Finish edges of laps with lap sealant.
- C.

3.8 FIELD QUALITY CONTROL

- A. Field Tests: Performed by testing laboratory specified in Section 01 45 29, TESTING LABORATORY SERVICES.

1. Fastener Pull Out Tests: ANSI/SPRI FX-1; one test for every 230 square meter (2,500 square feet of deck. Perform tests for each combination of fastener type and roof deck type before installing roof insulation.
 - a. Test at locations selected by Contracting Officer's Representative.
 - b. Do not proceed with roofing work when pull out resistance is less than manufacturer's required resistance.
 - c. Test Results:
 - 1) Repeat tests using different fastener type or use additional fasteners achieve pull out resistance required to meet specified wind uplift performance.
 - 2) Patch cementitious deck to repair areas of fastener tests holes.
2. Examine and probe roofing membrane and flashing seams in presence of Contracting Officer's Representative and Manufacturer's field representative.
3. Probe seams to detect marginal bonds, voids, skips, and fishmouths.
4. Cut 4 inch wide by 12 inch long samples through seams where directed by Contracting Officer's Representative.
5. Cut one sample for every 1500 feet of seams.
6. Cut samples perpendicular to seams.
7. Failure of samples to pass ASTM D1876 test will be cause for rejection of work.
8. Repair areas where samples are taken and where marginal bond, voids, and skips occur.
9. Repair fishmouths and wrinkles by cutting to lay flat. Install patch over cut area extending 4 inches beyond cut.
- B. Manufacturer Services:
 1. Inspect initial installation, installation in progress, and completed work.
 2. Issue supplemental installation instructions necessitated by field conditions.
 3. Prepare and submit inspection reports.
 4. Certify completed installation complies with manufacturer's instructions and warranty requirements.

3.9 CLEANING

- A. Remove excess adhesive before adhesive sets.
- B. Clean exposed roofing surfaces. Remove contaminants and stains to comply with specified solar reflectance performance.

3.10 PROTECTION

- A. Protect roofing system from traffic and construction operations.
 - 1. Protect roofing system when used for subsequent work platform, materials storage, or staging.
 - 2. Distribute scaffolding loads to exert maximum 50 percent roofing system materials compressive strength.
- B. Loose lay temporary insulation board overlaid with plywood or OSB.
 - 1. Weight boards to secure against wind uplift.
- C. Remove protective materials immediately before acceptance.
- D. Repair damage.

--- E N D ---

**SECTION 07 71 00
ROOF SPECIALTIES**

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. This section specifies copings, gravel stops, fascias, and expansion joints.

1.2 RELATED WORK:

- A. Sustainable Design Requirements: Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.
- B. Color and Texture of Finish: Section 09 06 00, SCHEDULE FOR FINISHES
- C. Sealant Material and Installation: Section 07 92 00, JOINT SEALANTS.
- D. General Insulation: Section 07 21 13, THERMAL INSULATION
- E. Rigid Insulations for Roofing: Section 07 22 00, ROOF AND DECK INSULATION

1.3 QUALITY CONTROL:

- A. Provide roof accessories that products of manufacturers regularly engaged in producing the kinds of products specified.
- B. For each accessory type provide products made by the same manufacturer.
- C. Assemble each accessory to the greatest extent possible before delivery to the site.
- D. Provide each accessory with FM approval listing for class specified.

1.4 PERFORMANCE REQUIREMENTS:

- A. Provide roof accessories that withstand exposure to weather and resist thermal movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, or installation.
- B. Provide roof accessories listed in FM Approvals "RoofNav" and approved for windstorm classification Class. Identify materials with FM Approval markings.
- C. Manufacture and install roof accessories to allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects.

1. Provide clips that resist rotation and avoid shear stress as a result of thermal movements.
2. For design purposes, base provisions for thermal movement on assumed ambient temperature (range) from minus 18 degrees C (0 degrees F), ambient to 82 degrees C (180 degrees F).

1.5 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Sustainable Design Submittals, as described below:
 1. Postconsumer and preconsumer recycled content as specified in PART 2 - PRODUCTS.
- C. Samples: Representative sample panel of color-anodized aluminum not less than 4 x 4 inches, except extrusions are to be of a width not less than section to be used. Submit sample that shows coating with integral color and texture. Include manufacturer's identifying label.
- D. Shop Drawings: Each item specified showing design, details of construction, installation and fastenings.
- E. Manufacturer's Literature and Data: Each item specified.
- F. Certificates: Stating that aluminum has been given specified thickness of anodizing.

1.6 APPLICABLE PUBLICATIONS:

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. ASTM International (ASTM):
 - A240/A240M-14Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
 - A653/A653M-13Steel Sheet Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot Dip Process
 - A666-10.....Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar

- B209-14Aluminum and Aluminum Alloy-Sheet and Plate
- B209M-14.....Aluminum and Aluminum Alloy-Sheet and Plate (Metric)
- B221-14Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and
Tubes
- B221M-13.....Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and
Tubes (Metric)
- B32-08(R2014)Solder Metal
- B370-12Copper Sheet and Strip for Building Construction
- B882-10Pre-Patinated Copper for Architectural Applications
- C612-14Mineral Fiber Block and Board Thermal Insulation
- D1187/D1187M-97 (R2011)...Asphalt-Base Emulsions for Use as Protective Coatings for
Metal
- D1970/D1970M-14Self-Adhering Polymer Modified Bituminous Sheet
Materials Used as Steep Roofing Underlayment for Ice
Dam Protection
- D226/D226M-09Asphalt-Saturated Organic Felt Used in Roofing and
Waterproofing
- D4869/D4969M-05(R2011) ...Asphalt-Saturated Organic Felt Underlayment Used In
Steep Slope Roofing
- C. National Association of Architectural Metal Manufacturers (NAAMM):
- AMP 500-06Metal Finishes Manual
- D. American Architectural Manufacturers Association (AAMA):
- 2605-11High Performance Organic Coatings on Architectural
Extrusions and Panels.
- 611-14Anodized Architectural Aluminum
- E. FM Global (FM):
- RoofNav.....Approved Roofing Assemblies and Products

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. Aluminum, Extruded: ASTM B221M (B221).
- B. Aluminum Sheet: ASTM B209M (B209).
- C. Galvanized Sheet Steel: ASTM A653/A653M; G-90 coating.
- D. Stainless-Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304.
- E. Copper Sheet: ASTM B370, cold-rolled copper sheet, H00 or H01 temper.
- F. Recycled Content of Metal Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 30 percent.
- G. Insulation: ASTM C612, Class 1 or 2.
- H. Asphalt Coating: ASTM D1187, Type I, quick setting.

2.2 UNDERLAYMENT:

- A. Self-Adhering Modified Bitumen Underlayment:
 - 1. Provide self-adhering modified bitumen membrane underlayment material in compliance with ASTM D1970/D1970M, suitable for use as underlayment for metal copings and fascias.
 - 2. Provide membrane resistant to cyclical elevated temperatures for extended period of time in high heat service conditions (stable after testing at 116 degrees C (240 degrees F)).
 - 3. Provide membrane with integral non-tacking top surface of polyethylene film or other surface material to serve as separator between bituminous material and metal products to be applied above.
 - 4. Provide primer.
- B. Felt Underlayment: Provide No. 30 asphalt saturated organic, non-perforated felt underlayment in compliance with ASTM D226/D226M, Type II, or ASTM D4869/D4869M.
- C. Slip Sheet: Provide 0.24 kg per square meter (5 pounds per 100 sf) rosin sized unsaturated building paper for slip sheet.

2.3 SOLDER:

- A. Copper Solder conforming to ASTM B32, lead-free solder Grade Sn50, 50 percent tin and 50 percent lead.

2.4 COPINGS:

- A. Fabricate of aluminum sheet not less than 0.08 inch thick; 16 oz. copper
- B. Turn outer edges down each face of wall as shown on construction documents.
- C. Maximum lengths of 10 feet.
- D. Shop fabricate external and internal corners as one-piece assemblies with not less than 12 inch leg lengths.
- E. Provide 4 inch wide 0.032 inch thick watertight joint covers.
- F. Provide anchor gutter bar of 0.032 inch thick with anchor holes formed for underside of joint.
- G. Provide concealed guttered splice plate of 0.032 inch thick with butyl or other resilient seal strips anchored to splice plate for underside of joint. Use galvanized steel anchor plate providing compression spring anchoring of coping cover.
- H. Finish: Two-coat fluoropolymer as specified.

2.5 EXTRUDED ALUMINUM GRAVEL STOPS AND FASCIAS:

- A. Fabricate of aluminum not less than 0.078 inch thick.
- B. Turn fascia down face of wall and up above roof as shown in construction documents.
- C. Maximum lengths of 10-feet.
- D. Shop fabricate external and internal corners as one (1)-piece assemblies with not less than 12 inch leg lengths.
- E. Provide 4 inch wide 0.078 inch thick watertight joint covers with 6 inch wide 0.030 inch thick underside joint flashing.
- F. Finish: Two-coat as specified.

2.6 EXTRUDED ALUMINUM FASCIA-CANT SYSTEM:

- A. The fascia-cant system consists of three (3) pieces, an extruded aluminum fascia, a galvanized steel cant, and an aluminum compression clamp.

- B. Furnish in stock lengths of not more than 10 feet long.
- C. Form fascia from not less than 0.070 inch thick aluminum. Provide 4 inch wide 0.032-inch thick concealed sheet aluminum joint cover plates in back of fascia.
- D. Form cant strip from galvanized steel not less than 0.0299 inch thick, to profile shown and design to hold lower edge of the fascia.
- E. Form compression clamp of not less than 0.032 inch thick aluminum designed to hold the top edge of the fascia and the built-up flashing.
- F. Internal and external corners:
 - 1. Factory fabricate and fully weld mitered joints.
 - 2. Furnish corner sections in manufacturers standard sizes with not less than 12 inch leg lengths.
- G. Factory fabricated fascia sump assemblies.
 - 1. Fabricate sump assemblies with stainless steel cores and extruded aluminum cover to match fascia-cant.
 - 2. Provide stainless steel outlet, tube sized to suit downspout and solder to core to make watertight.
 - 3. Furnish sump assembly in 20 inch minimum lengths.
- H. Factory fabricated scupper assemblies:
 - 1. Fabricate scupper assembly with extended plates to match fascia-cant in 20 inch minimum lengths.
 - 2. Extend outlet opening not less than 2 inches with drip edge.
 - 3. Fabricate with stainless steel core or sleeve to drain water from toe of cant and flash in to built-up roofing with 4 inch wide flange.
- I. Finish on aluminum: Two-coat fluoropolymer as specified.

2.7 EXTRUDED ALUMINUM ROOF EXPANSION JOINT COVERS:

- A. Fabricate in 10 foot lengths with fastener openings slotting for expansion not over 24 inch centers.
- B. Provide four-way expansion, for joint widths shown on construction documents.
- C. Mill finish.

- D. Form waterstop or moisture seals of continuous sheets of neoprene, not less than 0.032 inch thick.
- E. Fabricate corners as one (1) piece assembly with mitered and welded joint and least dimension legs not less than 12 inches long.
- F. Factory fabricate end caps and transitions to insure waterproof assembly.
- G. Five (5) piece assembly:
 - 1. Roof expansion joint cover system consists of an extruded aluminum cover, extruded frame or curb vertical section, galvanized steel cant, and aluminum compression clamp counter flashing, complete with moisture seals. Form cover and vertical section from extruded aluminum, 0.080 inch minimum thickness with spring stainless steel tension or pivot bar.
 - 2. Form cant from galvanized steel not less than 0.029 inch thick formed to profile shown on construction documents.
 - 3. Form splice plates of not less than 0.032 inch thick aluminum sheet.
 - 4. Form counter flashing member of 0.050 inch thick sheet aluminum, secured with screws to the top edge of the vertical section and providing compression clamp over base flashing.
 - 5. Provide compression gasket separating cover from curb bearing.
- H. Two (2) piece assembly:
 - 1. Roof expansion joint system consists of an extruded aluminum cover combination extruded aluminum frame or curb with integral adjustable counter flashing flange, and moisture seals.
 - 2. Form cover from extruded aluminum 0.078 inch minimum thickness.
 - 3. Form cover anchor system of stainless steel pivot bar.
 - 4. Form frame assembly of not less than 0.076 inch aluminum except for flashing portion.
 - 5. Provide compression gasket separating cover from curb at bearing.

2.8 FINISH:

- A. In accordance with NAAMM AMP 500-505.

B. Aluminum, Mill Finish: AA-MIX, as fabricated.

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. Examine substrates, areas, and conditions, to verify actual locations, dimensions, and other conditions affecting performance of the Work.
- B. Verify that substrate is sound, dry, smooth, clean, sloped for drainage where applicable, and securely anchored.
- C. Underlayment Installation:
 - 1. Self-Adhering Sheet Underlayment:
 - a. Apply primer as required by manufacturer.
 - b. Comply with temperature restrictions of underlayment manufacturer for installation.
 - c. Apply wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches staggered 24 inches between courses.
 - d. Overlap side edges not less than 3-1/2 inches. Roll laps with roller.
 - e. Cover underlayment within 14 days.
 - f. Apply continuously under copings and roof-edge fascias and gravel stops.
 - g. Coordinate application of self-adhering sheet underlayment under roof specialties with requirements for continuity with adjacent air barrier materials.
 - 3. Slip Sheet:
 - a. Install with tape or adhesive for temporary anchorage to minimize use of mechanical fasteners under roof specialties.
 - b. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches.
- D. Install roof accessories where indicated in construction documents.
- E. Secure with fasteners in accordance with manufacture's printed installation instructions and approved shop drawings unless shown otherwise. Provide fasteners suitable for

application, for metal types being secured and designed to meet performance requirements.

F. Where soldered joints are required, clean surfaces to be soldered, removing oils and foreign matter.

1. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches.
2. Reduce pre-tinning where pre-tinned surface would show in completed work.
3. Tin edges of uncoated copper sheets using solder for copper.
4. Do not use torches for soldering.
5. Heat surfaces to receive solder and flow solder into joint.
6. Fill joint completely.
7. Completely remove flux and spatter from exposed surfaces.

G. Coordinate to install insulation where shown; see Section 07 21 13, THERMAL INSULATION and Section 07 22 00, ROOF AND DECK INSULATION.

H. Comply with section 07 92 00, JOINT SEALANTS to install sealants where required by manufactures installation instructions.

I. Coordinate with roofing work for installation of items in sequence to prevent water infiltration.

J. Gravel Stops and Fascias:

1. Install gravel stops and fascia with butt joints with approximately 1/4 inch space for expansion.
2. Over each joint provide cover plates of sheet aluminum, complete with concealed sheet aluminum flashing, centered under each joint.
3. Provide lap cover plates and concealed flashing over the gravel stop and fascia not less than 4 inches.
4. Extend concealed flashing over built-up roofing, embed in roof cement and turn down over face of blocking at roof edge.

K. Aluminum Coping:

1. Install sections of coping with approximately 1/4-inch space between ends of sections.

2. Center joint gutter bar and covers at joints and lock in place.
3. When snap-on system is installed ensure front and back edges are locked in place.

L. Fascia-Cant System:

1. Install galvanized steel cant; coordinate with roofing work and after completion of roofing work install extruded aluminum fascia, concealed joint cover plate, and aluminum compression clamp, where shown in construction documents.
2. Install system to allow for expansion and contraction with 1/4 inch space between extruded aluminum members and galvanized steel cant as required by manufacturer of system.
3. Offset joints in extruded aluminum members from galvanized steel cant joints.

M. Expansion Joint Covers:

1. Install to terminate base flashing 8 inches above roof.
2. Install moisture seals to drain water to outlets that do not permit water to enter building.
3. Provide stainless steel screws when exposed.
4. Three piece assembly:
 - a. Install curb section with screws to wood blocking, allowing 1/4 inch at butt joints between sections with splice plate at joint.
 - b. Install cant to wood blocking by nailing along horizontal flange every 6 inches, with galvanized roofing nails 1 inch long.
 - c. After completion of base flashing install cap flashing and compression clamp and fasten to the curb or metal cant with stainless steel self-tapping screws with neoprene washers under head spaced approximately 18 inches on center.
 - d. Install expansion joint cover with a 1/4 inch wide end joints.
 - e. Install over end joint a cover plate complete with concealed aluminum flashing, centered under each joint. Fabricate flashing to lap cover not less than 4 inches.
5. Two piece assembly:
 - a. Install curb section with screws allowing 1/4 inch space at end joints with splice plate at joint.

- b. After completion of base flashing bend down cap flashing flange and secure to blocking with screws.
- c. Install expansion joint cover with 1/4 inch wide space at end joints and tension bars at 24 inches on center.
- d. Install cover plates with formed aluminum flashing concealed and centered on joint. Flashing to lap cover not less than 4 inches.

3.2 PROTECTION OF ALUMINUM:

- A. Provide protection for aluminum against galvanic action wherever dissimilar materials are in contact, by painting the contact surfaces of the dissimilar material with two (2) coats of asphalt coating (complete coverage), or by separating the contact surfaces with a preformed neoprene tape having pressure sensitive adhesive coating on one (1) side.
- B. Paint aluminum in contact with wood, concrete and masonry, or other absorptive materials, that may become repeatedly wet, with two (2) coats of asphalt coating.

3.3 ADJUSTING:

- A. Adjust expansion joints to close tightly and be watertight; insuring maximum allowance for building movement.

3.4 PROTECTION:

- A. Protect roof accessories from damage during installation and after completion of the work from subsequent construction.

--- E N D ---

**SECTION 07 72 00
ROOF ACCESSORIES**

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. This section specifies roof hatches; equipment supports; gravity ventilators; and metal grating roof walkway system.

1.2 RELATED WORK:

- A. Sustainable Design Requirements: Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.
- B. Color and texture of finish: Section 09 06 00, SCHEDULE FOR FINISHES.
- C. Sealant material and installation: Section 07 92 00, JOINT SEALANTS.
- D. General insulation: Section 07 21 13, THERMAL INSULATION. Rigid insulations for roofing: Section 07 22 00, ROOF AND DECK INSULATION

1.3 QUALITY ASSURANCE:

- A. Provide roof accessories that are the products of manufacturers regularly engaged in producing the kinds of products specified.
- B. For each accessory type provide the same product made by the same manufacturer.
- C. Assemble each accessory to the greatest extent possible before delivery to the site.

1.4 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Sustainable Design Submittals, as described below:
 - 1. Postconsumer and preconsumer recycled content as specified in PART 2 - PRODUCTS
- C. Samples: Submit representative sample panel of color anodized aluminum not less than 4 x 4 inches. For extrusions, submit width not less than section to be installed. Show coating with integral color and texture and include manufacturer's identifying label.
- D. Shop Drawings: Each item specified showing design, details of construction, installation and fastenings.
- E. Manufacturer's Literature and Data: Each item specified.

- F. Certificates: Stating that aluminum has been given specified thickness of anodizing.

1.5 APPLICABLE PUBLICATIONS:

- A. The publications listed below form a part of this specification to the extend referenced.

The publications are referenced in the text by the basic designation only.

- B. Federal Specifications (Fed. Spec.):

RR-G-1602D.....Grating, Metal, Other Than Bar Type (Floor, Except for
Naval Vessels)

- C. ASTM International (ASTM):

A653/A653M-10Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-
Coated (Galvannealed) By the Hot-Dip Process

B209-14Aluminum and Aluminum Alloy-Sheet and Plate

B209M-14.....Aluminum and Aluminum-Alloy Sheet and Plate (Metric)

B221-14Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and
Tubes

B221M-13.....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire,
Shapes, and Tubes (Metric)

C726-12Mineral Wool Roof Insulation Board

C1289-14aFaced Rigid Cellular Polyisocyanurate Thermal Insulation
Board

D1187/D1187M-97(R2011) ...Asphalt-Base Emulsions for Use as Protective Coatings for
Metal

- D. National Association of Architectural Metal Manufacturers (NAAMM):

AMP 500 SeriesMetal Finishes Manual

- E. American Architectural Manufacturers Association (AAMA):

2603-13Performance Requirements and Test Procedures for
Pigmented Organic Coatings on Aluminum Extrusions and
Panels

2605-13High Performance Organic Coatings on Architectural
Extrusions and Panels.

- 611-14Anodized Architectural Aluminum
- 621-02High Performance Organic Coatings on Coil Coated
Architectural Hot Dipped Galvanized (HDG) and Zinc-
Aluminum Coated Steel Substrates

F. American Society of Civil Engineers (ASCE):

- ASCE 7-10Minimum Design Loads for Buildings and Other Structures

G. U.S. National Archives and Records Administration (NARA):

- 29 CFR 1910.23Guarding Floor and Wall Openings and Holes

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. Aluminum, Extruded: ASTM B221M (B221).
- B. Aluminum Sheet: ASTM B209M (B209).
- C. Galvanized Sheet Steel: ASTM A653/A653M; G-90 coating.
- D. Metal Grating for Roof Walkway: Fed. Spec. RR-G-1602.
- E. Recycled Content of Metal Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 30 percent.
- F. Asphalt Coating: ASTM D1187/D1187M, Type I, quick setting.

2.2 ROOF HATCH (SCUTTLE):

- A. Performance Characteristics:
 - 1. Cover to be reinforced to support a minimum live load of 40 lb. per sq. ft.) with a maximum deflection of 1/150th of the span or 20 lb. per sq. ft.) wind uplift.
 - 2. Operation of the Cover: Smooth and easy with controlled operation throughout the entire arc of opening and closing.
 - 3. Operation of the Cover: Not affected by temperature.
 - 4. Entire Hatch: Weathertight with fully welded corner joints on cover and curb.
- B. Shop fabricate from aluminum with mill finish.
- C. Curb and Cover:
 - 1. Exterior facing: Minimum 0.09 inch thick sheet aluminum with mill finish.

2. Interior facing: Minimum 0.04 inch thick sheet aluminum.
3. Minimum of 2 inch thick polyisocyanurate insulation (ASTM C1289) with a U-value = $0.47 \text{ W/m}^2 \text{ K}$ (R-value = 12) between facings of cover and over exterior face of curb.
4. Form exterior curb facing with an integral 3 inch wide roof flange and cap flashing minimum 0.09 inch thick sheet aluminum.
5. Make curb 12 inches above finish roof surface.
6. Form cover to lap curb and cap flashing.
7. Size opening as shown on construction documents.
8. Finish: See approved drawings

D. Hardware:

1. Provide spring snap latch with inside and outside operating handles and padlock hasp on inside. Provide two snap latches when hinge side is over 7 feet long. Bolt hardware into heavy gauge channel reinforcement welded to the underside of the cover and concealed within the insulation space.
2. Provide heavy duty pintle hinges.
3. Provide automatic hold open and operating arm with enclosed torsion or compression spring lifting mechanism.
4. Latch Strike: Stamped component bolted or welded to the curb assembly.
5. Automatically lock in the open position at not less than 70 degrees.
6. Provide weatherstripping at cover closure.
7. Galvanize all hardware items.

E. Assembly:

1. Shop assemble roof scuttle.
2. Weld joints exposed to the weather and built into the roofing.
3. Finish weld smooth where exposed.

F. Safety Accessories:

1. Ladder Assist Post: Provide a telescoping tubular section that locks automatically when fully extended. Control upward and downward movement by a stainless steel

spring balancing mechanism. Provide unit completely assembled with fasteners for securing to the ladder rungs in accordance with the manufacturer's instructions.

2. Safety Railing: Provide a fixed, attached to the roof hatch railing assembly including rails, clamps, fasteners, safety barrier at railing opening, and accessories required for a complete installation; complying with 29 CFR 1910.23 requirements.

2.3 EQUIPMENT SUPPORTS:

- B. Fabricate equipment supports from 0.0516 inch thick galvanized ASTM A653/A653M steel fabricate with welded corners and with seams joined by continuous water and air tight welds.
- C. Equipment supports to be internally reinforced with angles 48 inches on center.
- D. Form exterior curb with integral base, and deck closures for curbs installed on steel decking.
- E. Use galvanized steel liners for curbs having inside dimension over 12 inches.
- F. Internally insulate with 1-1/2 inch glass-fiber board insulation (ASTM C726).
- G. Fabricate curb with a minimum height of 8 inches above roof surface.
- H. Attach preservative treated wood nailers to top of curb. Provide 2 inch by 2 inch minimum nominal size on curb with openings and 2 inch thick, width of curb up to 12 inches on equipment support curbs.
- H. Make size of supports suit size of equipment furnished, with height as shown on construction documents, but not less than 8 inches above roof surface.
- I. Top of Equipment Supports: Level with pitch built into curb when deck slopes. Equip supports with water diverter or cricket on side that obstructs water flow.

2.6 FINISH:

- A. In accordance with NAAMM AMP 500 Series.
- B. Aluminum, Mill Finish: AA-MIX, as fabricated.

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. Install roof specialties where indicated on construction documents.

- B. Secure with fasteners in accordance with manufacture's printed installation instructions and approved shop drawings unless shown otherwise.
- C. Coordinate to install insulation where shown; see Section 07 21 13, THERMAL INSULATION and Section 07 22 00, ROOF AND DECK INSULATION.
- D. Comply with section 07 92 00, JOINT SEALANTS to install sealants where required by manufactures installation instructions require sealant.
- E. Coordinate with roofing work for installation of items in sequence to prevent water infiltration.
 - 1. After completion of base flashing bend down cap flashing flange and secure to blocking with screws.
 - 2. Install expansion joint cover with 1/4 inch wide space at end joints and tension bars at 24 inches on center.
 - 3. Install cover plates with formed aluminum flashing concealed and centered on joint. Flashing to lap cover not less than 4 inches.
- F. Equipment Supports: Do not anchor to insulating concrete or metal deck. Anchor only to building structure as per manufacturers recommendations.

3.2 PROTECTION OF ALUMINUM:

- A. Provide protection for aluminum against galvanic action wherever dissimilar materials are in contact, by painting the contact surfaces of the dissimilar material with two (2) coats of asphalt coating (complete coverage), or by separating the contact surfaces with a preformed neoprene tape having pressure sensitive adhesive coating on side.
- B. Paint aluminum in contact with wood, concrete and masonry, or other absorptive materials, that may become repeatedly wet, with two coats of asphalt coating.

3.3 ADJUSTING:

- A. Adjust roof hatch hardware to operate freely and so that cover will operate without binding, close tightly at perimeter, and latch securely.

3.4 PROTECTION:

- A. Protect roof accessories from damage during installation and after completion of the work from subsequent construction.

CONSTRUCT PRIMARY CARE / MENTAL HEALTH BUILDING
BOISE VA MEDICAL CENTER - BOISE, ID

PROJECT #: 531-325
CONSTRUCTION DOCUMENTS

--- E N D ---

**SECTION 07 81 00
APPLIED FIREPROOFING**

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. This section specifies spray-applied mineral fiber and cementitious coverings to provide fire resistance to interior structural steel members shown.

1.2 RELATED WORK:

- A. Sustainable Design Requirements: Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.

1.3 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Sustainable Design Submittals, as described below:
 - 1. Volatile organic compounds per volume as specified in PART 2 - PRODUCTS.
- C. Installer qualifications.
- D. Testing laboratory accreditations.
- E. Manufacturer's Literature and Data:
 - 1. Manufacturer's complete and detailed application instructions and specifications.
 - 2. Manufacturer's repair and patching instructions.
- F. Certificates:
 - 1. Certificate from testing laboratory attesting fireproofing material and application method meet the specified fire ratings.
 - a. List thickness and density of material required to meet fire ratings.
 - b. Accompanied by complete test report and test record.
 - 2. Manufacturer's certificate indicating sprayed-on fireproofing material supplied under the Contract is same within manufacturing tolerance as fireproofing material tested.
- G. Miscellaneous:
 - 1. Manufacturer's written approval of surfaces to receive sprayed-on fireproofing.

2. Manufacturer's written approval of completed installation.
3. Manufacturer's written approval of the applicators of fireproofing material.

1.3 PRODUCT DELIVERY, STORAGE AND HANDLING:

- A. Deliver to job-site in sealed containers marked and labeled to show manufacturer's name and brand and UL certification markings of compliance with the specified requirements.
- B. Remove damaged or opened containers from the site.
- C. Store the materials off the ground, under cover, away from damp surfaces.
- D. Keep dry until ready for use.
- E. Remove materials that have been exposed to water before installation from the site.

1.4 FIELD CONDITIONS:

- A. Temperature: Do not apply fireproofing when substrate or ambient temperature is below 4 degrees C (40 degrees F) unless temporary protection and heat are provided to maintain temperature at or above stated value during application and for 24 hours before and after application.
- B. Humidity: Maintain relative humidity levels within limits recommended by fireproofing manufacturer.
- C. Ventilation: Provide ventilation to properly dry the fireproofing after application. Provide a minimum of four (4) air exchanges per hour by forced air circulation. When permitted by Contracting Officer Representative (COR), ventilate by natural circulation.

1.5 QUALITY ASSURANCE:

- A. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by fireproofing manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements. Submit manufacturer's certification that each installer is trained and qualified to install the specified fireproofing. Submit evidence that each installer has a minimum of three (3) years' experience and a minimum of four (4) installations using the specified fireproofing.

- B. Testing Laboratory Accreditation Requirements: Construction materials testing laboratories must be accredited by a laboratory accreditation authority. Submit a copy of the Certificate of Accreditation and Scope of Accreditation.
- C. Test for fire endurance in accordance with ASTM E119, for fire rating specified, in a nationally recognized laboratory.
- D. Manufacturer's inspection and approval of surfaces to receive fireproofing.
- E. Manufacturer's approval of fireproofing applications.
- F. Manufacturer's approval of completed installation.
- G. Manufacturer's representative is to observe and advise at the commencement of application, and is required to visit the site as required thereafter for the purpose of ascertaining proper application.
- H. Pre-Application Test Area.
 - 1. Apply a test area consisting of a typical overhead fireproofing installation, including not less than 15 feet of beam and deck.
 - a. Apply to one (1) column.
 - b. Apply for the hourly ratings required in the construction documents.
 - 2. Install in location selected by the COR, for approval by the representative of the fireproofing material manufacturer and the COR.
 - 3. Perform Bond test for cohesive and adhesive strength in accordance with ASTM E736 for each applied fireproofing design used.
 - 4. Perform density test in accordance with ASTM E736 for each applied fireproofing design used.
 - 5. Do not proceed in other areas until installation of test area has been completed and approved.
 - 6. Keep approved installation area open for observation as criteria for sprayed-on fireproofing.

1.6 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.

B. ASTM International (ASTM):

C841-03(R2013)	.....Installation of Interior Lathing and Furring
C847-14	.....Metal Lath
E84-14	.....Surface Burning Characteristics of Building Materials
E119-12a	.....Fire Tests of Building Construction and Materials
E605-93(R2011)	.....Thickness and Density of Sprayed Fire-Resistive Materials Applied to Structural Members
E736-00(R2011)	.....Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members
E759-92(R2011)	.....The Effect of Deflection on Sprayed Fire-Resistive Material Applied to Structural Members
E760-92(R2011)	.....Impact on Bonding of Sprayed Fire-Resistive Material Applied to Structural Members
E761-92(R2011)	.....Compressive Strength of Fire-Resistive Material Applied to Structural Members
E859-93(R2011)	.....Air Erosion of Sprayed Fire-Resistive Materials Applied to Structural Members
E937-93(R2011)	.....Corrosion of Steel by Sprayed Fire-Resistive Material Applied to Structural Members
E1042-02(R2014)	.....Acoustically, Absorptive Materials Applied by Trowel or Spray.
G21-13	.....Determining Resistance of Synthetic Polymeric Materials to Fungi

C. Underwriters Laboratories, Inc. (UL):

Fire Resistance Directory...Latest Edition including Supplements

D. Warnock Hersey (WH):

Certification Listings.....Latest Edition

E. Factory Mutual System (FM):

Approval GuideLatest Edition including Supplements

F. Environmental Protection Agency (EPA):

40 CFR 59(2014).....National Volatile Organic Compound Emission Standards
for Consumer and Commercial Products

PART 2 - PRODUCTS

2.1 SPRAYED-ON FIREPROOFING:

- A. ASTM E1042, Class (a), Category A.
1. Type I, factory mixed cementitious materials with approved aggregate.
 2. Type II, factory mixed mineral fiber with integral inorganic binders minimum 240 kg per cubic meter (15 lb. per cubic feet density per ASTM E605 test unless specified otherwise. Use in areas that are completely encased.
- B. Materials containing asbestos are not permitted.
- C. Fireproofing characteristics when applied in the thickness and density required to achieve the fire-rating specified.

	Characteristic	Test	Results
1.	Deflection	ASTM E759	No cracking, spalling, or delamination when backing to which it is applied has a deflection up to 1/120 10 ft.)
2.	Corrosion-Resistance	ASTM E937	No promotion of corrosion of steel.
3.	Bond Impact	ASTM E760	No cracking, spalling, or delamination.
4.	Cohesion/Adhesion (Bond Strength)	ASTM E736	Minimum cohesive/adhesive strength of 9.57 kPa (200 lbf per sq. ft.) for protected areas. 19.15 kPa (400 lbf per sq. ft.) for exposed areas.
5.	Air Erosion	ASTM E859	Maximum gain weight of the collecting filter 0.27 gm per sq. meter (0.025 gm per sq. ft.).

6.	Compressive Strength	ASTM E761	Minimum compressive strength 48 kPa (1000 psf).
7.	Surface Burning Characteristics with adhesive and sealer to be used	ASTM E84	Flame spread 25 or less smoke developed 50 or less
8.	Fungi Resistance	ASTM G21	Resistance to mold growth when inoculated with aspergillus niger (28 days for general application)

2.2 ADHESIVE:

- A. Bonding adhesive for Type II (fibrous) materials as recommended and supplied by the fireproofing material manufacturer.
- B. Adhesive may be an integral part of the material or applied separately to surface receiving fireproofing material.

2.3 SEALER:

- A. Sealer for Type II (fibrous) material as recommended and supplied by the fireproofing material manufacturer.
- B. Surface burning characteristics as specified for fireproofing material.
- C. Fungus resistant.
- D. Sealer may be an integral part of the material or applied separately to the exposed surface. When applied separately use contrasting color pigmented sealer, white preferred.
- E. VOC content: Product to comply with VOC content limits of authorities having jurisdiction and the following VOC limits when calculated according to 40 CFR 59, (EPA Method 24):
 - 1. Flat Paints and Coatings: 50 g/L.
 - 2. Nonflat Paints and Coatings: 150 g/L.
 - 3. Primers, Sealers, and Undercoaters: 200 g/L.

2.4 WATER:

- A. Clean, fresh, and free from organic and mineral impurities.
- B. pH of 6.9 to 7.1.

2.5 MECHANICAL BOND MATERIAL:

- A. Expanded Metal Lath: ASTM C847, minimum weight of 0.92 kg per square meter (1.7 pounds per square yard) or as required, according to fire-resistance designs indicated and fire proofing manufacturer's written instructions.
- B. Fasteners: ASTM C841.
- C. Reinforcing Fabric: Glass- or carbon-fiber fabric of type, weight, and form required to comply with fire-resistance designs indicated; approved and provided by fireproofing manufacturer.
- D. Reinforcing Mesh: Metallic mesh reinforcement of type, weight, and form required to comply with fire-resistance design indicated; approved and provided by fireproofing manufacturer. Include pins and attachments.

PART 3 - EXECUTION

3.1 EXAMINATION:

- A. Verify surfaces to receive fireproofing are clean and free of dust, soot, oil, grease, water soluble materials or any foreign substance which would prevent adhesion of the fireproofing material.
- B. Verify hangers, inserts and clips are installed before the application of fireproofing material.
- C. Verify ductwork, piping, and other obstructing material and equipment is not installed that will interfere with fireproofing installation.
- D. Verify concrete work on steel decking and concrete encased steel is completed.
- E. When applied in conjunction with roof structures or roof decks, verify that roofing, installation of rooftop HVAC equipment, and other related work are complete.
- F. Verify temperature and enclosure conditions required by fire-proofing material manufacturer.
- G. Conduct tests according to fireproofing manufacturer's written instructions to verify that substrates are free of substances capable of interfering with bond. Submit test report.

3.2 APPLICATION:

- A. Do not start application until written approval has been obtained from manufacturer of fireproofing materials that surfaces have been inspected by the manufacturer or his representative, and are suitable to receive sprayed-on fireproofing.
- B. Coordinate application of fireproofing material with other trades.
- C. Cover other work and exterior openings subject to damage from fallout or overspray of fireproofing materials during application.
- D. Application of Metal Lath:
 - 1. Apply to beam and columns having painted surfaces which fail ASTM E736 Bond Test requirements in pre-application test area.
 - 2. Apply to beam flanges 12-inches or more in width.
 - 3. Apply to column flanges 16-inches or more in width.
 - 4. Apply to beam or column web 16-inches or more in depth.
 - 5. Tack weld or mechanically fasten on maximum of 12-inch center.
 - 6. Lap and tie lath member in accordance with ASTM C841.
- E. Mix and apply in accordance with manufacturer's instructions.
 - 1. Mechanically control material and water ratios.
 - 2. Apply adhesive and sealer, when not an integral part of the materials, in accordance with the manufacturer's instructions.
 - 3. Apply to density and thickness indicated in UL Fire Resistance Directory, FM Approval Guide, or WH Certification Listings unless specified otherwise. Test in accordance with ASTM E119.
 - 4. Minimum ASTM E605 applied dry density per cubic meter (cubic foot for the underside of the walk on deck (interstitial) hung purlin or beam and steel deck, columns in interstitial spaces and mechanical equipment rooms to be as follows:
 - a. Type I - 22 lb. per cubic ft.
 - b. Type II - 15 lb. per cubic ft.
 - c. Provide materials with higher density of 40 lb. per cubic feet in mechanical rooms and parking garages.

- F. Complete application is to be completed in one area. Inspection and approval by COR is required before removal of application equipment and proceeding with further work.

3.3 FIELD TESTS:

- A. The applied fireproofing to be tested by a COR approved independent testing laboratory and paid for by the Contractor. Submit test reports documenting results of tests on the applied material in the project.
- B. COR will select area to be tested in specific bays on each floor using a geometric grid pattern. Apply test sample every 929 square meters (10,000 square feet of floor area or two (2) for each floor, whichever produces the greatest number of test areas.
- C. Test for thickness and density in accordance with ASTM E605. Areas showing thickness less than that required as a result of fire endurance test are not acceptable.
- D. Areas showing less than required fireproofing characteristics are not suitable for the following field tests.
 - 1. Test for cohesion/adhesion: ASTM E736.
 - 2. Test for bond impact strength: ASTM E760.

3.4 PATCHING AND REPAIRING:

- A. Inspect after mechanical, electrical and other trades have completed work in contact with fireproofing material, but before sprayed material is covered by subsequent construction.
- B. Perform corrective measures in accordance with fireproofing material manufacturer's recommendations.
 - 1. Respray areas requiring additional fireproofing material to provide the required thickness, and replace dislodged or removed material.
 - 2. Spray material for patching by machine directly on point to be patched, or into a container and then hand apply.
 - 3. Do not hand mix material.
- C. Repair:
 - 1. Respray test and rejected areas.
 - 2. Patch fireproofing material which is removed or disturbed after approval.

D. Perform final inspection of sprayed areas after patching and repair.

--- E N D ---

**SECTION 07 84 00
FIRESTOPPING**

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. Provide UL or equivalent approved firestopping system for the closures of openings in walls, floors, and roof decks against penetration of flame, heat, and smoke or gases in fire resistant rated construction.
- B. Provide UL or equivalent approved firestopping system for the closure of openings in walls against penetration of gases or smoke in smoke partitions.

1.2 RELATED WORK:

- A. Sustainable Design Requirements: Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.
- B. Expansion and seismic joint firestopping: Section 07 95 13, EXPANSION JOINT COVER ASSEMBLIES.
- C. Spray applied fireproofing: Section 07 81 00, APPLIED FIREPROOFING
- D. Sealants and application: Section 07 92 00, JOINT SEALANTS.
- E. Fire and smoke damper assemblies in ductwork: Section 23 31 00, HVAC DUCTS AND CASINGS Section 23 37 00, AIR OUTLETS AND INLETS.

1.3 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Sustainable Design Submittals, as described below:
 - 1. Volatile organic compounds per volume as specified in PART 2 - PRODUCTS
- C. Installer qualifications.
- D. Inspector qualifications.
- E. Manufacturers literature, data, and installation instructions for types of firestopping and smoke stopping used.
- F. List of FM, UL, or WH classification number of systems installed.

- G. Certified laboratory test reports for ASTM E814 tests for systems not listed by FM, UL, or WH proposed for use.
- H. Submit certificates from manufacturer attesting that firestopping materials comply with the specified requirements.

1.4 DELIVERY AND STORAGE:

- A. Deliver materials in their original unopened containers with manufacturer's name and product identification.
- B. Store in a location providing protection from damage and exposure to the elements.

1.5 QUALITY ASSURANCE:

- A. FM, UL, or WH or other approved laboratory tested products will be acceptable.
- B. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991 or been evaluated by UL and found to comply with UL's "Qualified Firestop Contractor Program Requirements." Submit qualification data.
- C. Inspector Qualifications: Contractor to engage a qualified inspector to perform inspections and final reports. The inspector to meet the criteria contained in ASTM E699 for agencies involved in quality assurance and to have a minimum of two years' experience in construction field inspections of firestopping systems, products, and assemblies. The inspector to be completely independent of, and divested from, the Contractor, the installer, the manufacturer, and the supplier of material or item being inspected. Submit inspector qualifications.

1.6 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.
- B. ASTM International (ASTM):
 - E84-14Surface Burning Characteristics of Building Materials
 - E699-09Standard Practice for Evaluation of Agencies Involved in Testing, Quality Assurance, and Evaluating of Building Components
 - E814-13aFire Tests of Through-Penetration Fire Stops

E2174-14Standard Practice for On-Site Inspection of Installed
Firestops

E2393-10aStandard Practice for On-Site Inspection of Installed Fire
Resistive Joint Systems and Perimeter Fire Barriers

C. FM Global (FM):

Annual Issue Approval Guide Building Materials

4991-13Approval of Firestop Contractors

D. Underwriters Laboratories, Inc. (UL):

Annual Issue Building Materials Directory

Annual Issue Fire Resistance Directory

723-10(2008).....Standard for Test for Surface Burning Characteristics of
Building Materials

1479-04(R2014)Fire Tests of Through-Penetration Firestops

E. Intertek Testing Services - Warnock Hersey (ITS-WH):

Annual Issue Certification Listings

F. Environmental Protection Agency (EPA):

40 CFR 59(2014).....National Volatile Organic Compound Emission Standards
for Consumer and Commercial Products

PART 2 - PRODUCTS

2.1 FIRESTOP SYSTEMS:

- A. Provide either factory built (Firestop Devices) or field erected (through-Penetration Firestop Systems) to form a specific building system maintaining required integrity of the fire barrier and stop the passage of gases or smoke. Firestop systems to accommodate building movements without impairing their integrity.
- B. Through-penetration firestop systems and firestop devices tested in accordance with ASTM E814 or UL 1479 using the "F" or "T" rating to maintain the same rating and integrity as the fire barrier being sealed. "T" ratings are not required for penetrations smaller than or equal to 101 mm (4 in.) nominal pipe or 0.01 sq. m (16 sq. in.) in overall cross sectional area.

- C. Firestop sealants used for firestopping or smoke sealing to have the following properties:
 - 1. Contain no flammable or toxic solvents.
 - 2. Release no dangerous or flammable out gassing during the drying or curing of products.
 - 3. Water-resistant after drying or curing and unaffected by high humidity, condensation or transient water exposure.
 - 4. When installed in exposed areas, capable of being sanded and finished with similar surface treatments as used on the surrounding wall or floor surface.
 - 5. VOC Content: Firestopping sealants and sealant primers to comply with the following limits for VOC content when calculated according to 40 CFR 59, (EPA Method 24):
 - a. Sealants: 250 g/L.
 - b. Sealant Primers for Nonporous Substrates: 250 g/L.
 - c. Sealant Primers for Porous Substrates: 775 g/L.
- D. Firestopping system or devices used for penetrations by glass pipe, plastic pipe or conduits, unenclosed cables, or other non-metallic materials to have following properties:
 - 1. Classified for use with the particular type of penetrating material used.
 - 2. Penetrations containing loose electrical cables, computer data cables, and communications cables protected using firestopping systems that allow unrestricted cable changes without damage to the seal.
- E. Maximum flame spread of 25 and smoke development of 50 when tested in accordance with ASTM E84 or UL 723. Material to be an approved firestopping material as listed in UL Fire Resistance Directory or by a nationally recognized testing laboratory.
- F. FM, UL, or WH rated or tested by an approved laboratory in accordance with ASTM E814.
- G. Materials to be nontoxic and noncarcinogen at all stages of application or during fire conditions and to not contain hazardous chemicals. Provide firestop material that is free from Ethylene Glycol, PCB, MEK, and asbestos.

- H. For firestopping exposed to view, traffic, moisture, and physical damage, provide products that do not deteriorate when exposed to these conditions.
1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
 2. For floor penetrations with annular spaces exceeding 101 mm (4 in.) or more in width and exposed to possible loading and traffic, provide firestop systems capable of supporting the floor loads involved either by installing floor plates or by other means acceptable to the firestop manufacturer.
 3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

2.2 SMOKE STOPPING IN SMOKE PARTITIONS:

- A. Provide silicone sealant in smoke partitions as specified in Section 07 92 00, JOINT SEALANTS.
- B. Provide mineral fiber filler and bond breaker behind sealant.
- C. Sealants to have a maximum flame spread of 25 and smoke developed of 50 when tested in accordance with ASTM E84.
- D. When used in exposed areas capable of being sanded and finished with similar surface treatments as used on the surrounding wall or floor surface.

PART 3 - EXECUTION

3.1 EXAMINATION:

- A. Submit product data and installation instructions, as required by article, submittals, after an on-site examination of areas to receive firestopping.
- B. Examine substrates and conditions with installer present for compliance with requirements for opening configuration, penetrating items, substrates, and other conditions affecting performance of firestopping. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION:

- A. Remove dirt, grease, oil, laitance and form-release agents from concrete, loose materials, or other substances that prevent adherence and bonding or application of the firestopping or smoke stopping materials.
- B. Remove insulation on insulated pipe for a distance of 150 mm (6 inches) on each side of the fire rated assembly prior to applying the firestopping materials unless the firestopping materials are tested and approved for use on insulated pipes.
- C. Prime substrates where required by joint firestopping system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- D. Masking Tape: Apply masking tape to prevent firestopping from contacting adjoining surfaces that will remain exposed upon completion of work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestopping materials. Remove tape as soon as it is possible to do so without disturbing seal of firestopping with substrates.

3.3 INSTALLATION:

- A. Do not begin firestopping work until the specified material data and installation instructions of the proposed firestopping systems have been submitted and approved.
- B. Install firestopping systems with smoke stopping in accordance with FM, UL, WH, or other approved system details and installation instructions.
- C. Install smoke stopping seals in smoke partitions.
- D. Install approved fire stopping sealant around items that penetrate between floors. Install sealant around penetrations at both sides of floor level, at floor level of penetration and underside of floor level below.
- E. Properly seal all abandoned penetrations through rated walls and floors. In floors, use grout, the full thickness of the slab, to meet fire rating requirements.
- F. Install temporary fire stopping systems at each penetration between rated floors or wall assemblies at the end of each working shift until permanent fire stopping systems have been installed.

3.4 CLEAN-UP:

- A. As work on each floor is completed, remove materials, litter, and debris.
- B. Clean up spills of liquid type materials.
- C. Clean off excess fill materials and sealants adjacent to openings and joints as work progresses by methods and with cleaning materials approved by manufacturers of firestopping products and of products in which opening and joints occur.
- D. Protect firestopping 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 and remove damaged or deteriorated firestopping immediately and install new materials to provide firestopping complying with specified requirements.

3.5 INSPECTIONS AND ACCEPTANCE OF WORK:

- A. Do not conceal or enclose firestop assemblies until inspection is complete and approved by the Contracting Officer Representative (COR).
- B. Furnish service of approved inspector to inspect firestopping in accordance with ASTM E2393 and ASTM E2174 for firestop inspection, and document inspection results. Submit written reports indicating locations of and types of penetrations and type of firestopping used at each location; type is to be recorded by UL listed printed numbers.

--- E N D ---

**SECTION 07 92 00
JOINT SEALANTS**

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. This section covers interior and exterior sealant and their application, wherever required for complete installation of building materials or systems.

1.2 RELATED WORK (INCLUDING BUT NOT LIMITED TO THE FOLLOWING):

- A. Sustainable Design Requirements: Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.
- C. Masonry Control and Expansion Joint: Section 04 20 00, UNIT MASONRY.
- D. Firestopping Penetrations: Section 07 84 00, FIRESTOPPING.
- E. Glazing: Section 08 80 00, GLAZING.
- F. Glazed Aluminum Curtain Wall: Section 08 44 13, GLAZED ALUMINUM CURTAIN WALLS.
- G. Sound Rated Gypsum Partitions/Sound Sealants: Section 09 29 00, GYPSUM BOARD.
- H. Mechanical Work: Section 21 05 11, COMMON WORK RESULTS FOR FIRE SUPPRESSIONSection 22 05 11, COMMON WORK RESULTS FOR PLUMBINGSection 23 05 11, COMMON WORK RESULTS FOR HVAC AND STEAM GENERATION.

1.3 QUALITY ASSURANCE:

- A. Installer Qualifications: An experienced installer with a minimum of three (3) years' experience and who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint-sealant installations with a record of successful in-service performance. Submit qualification.
- B. Source Limitations: Obtain each type of joint sealant through one (1) source from a single manufacturer.
- C. Product Testing: Obtain test results from a qualified testing agency based on testing current sealant formulations within a 12-month period.
 - 1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021.

2. Test elastomeric joint sealants for compliance with requirements specified by reference to ASTM C920, and where applicable, to other standard test methods.
 3. Test elastomeric joint sealants according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C920 for adhesion and cohesion under cyclic movement, adhesion-in peel, and indentation hardness.
 4. Test other joint sealants for compliance with requirements indicated by referencing standard specifications and test methods.
- D. Lab Tests: Submit samples of materials that will be in contact or affect joint sealants to joint sealant manufacturers for tests as follows:
1. Adhesion Testing: Before installing elastomeric sealants, test their adhesion to protect joint substrates according to the method in ASTM C794 to determine if primer or other specific joint preparation techniques are required.
 2. Compatibility Testing: Before installing elastomeric sealants, determine compatibility when in contact with glazing and gasket materials.
 3. Stain Testing: Perform testing per ASTM C1248 on interior and exterior sealants to determine if sealants or primers will stain adjacent surfaces. No sealant work is to start until results of these tests have been submitted to the Contracting Officer Representative (COR) and the COR has given written approval to proceed with the work.
- E. Preconstruction Field-Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to joint substrates according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1.1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521.
1. Locate test joints where indicated in construction documents or, if not indicated, as directed by COR.
 2. Conduct field tests for each application indicated below:
 - a. Each type of elastomeric sealant and joint substrate indicated.
 - b. Each type of non-elastomeric sealant and joint substrate indicated.

3. Notify COR seven (7) days in advance of dates and times when test joints will be erected.

4. Arrange for tests to take place with joint sealant manufacturer's technical representative present.

F. Mockups: Before installing joint sealants, apply elastomeric sealants as follows to verify selections and to demonstrate aesthetic effects and qualities of materials and execution:

1. Joints in mockups of assemblies that are indicated to receive elastomeric joint sealants.

1.4 CERTIFICATION:

A. Contractor is to submit to the COR written certification that joints are of the proper size and design, that the materials supplied are compatible with adjacent materials and backing, that the materials will properly perform to provide permanent watertight, airtight or vapor tight seals (as applicable), and that materials supplied meet specified performance requirements.

1.5 SUBMITTALS:

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Sustainable Design Submittals, as described below:

1. Volatile organic compounds per volume as specified in PART 2 - PRODUCTS

C. Installer qualifications.

D. Contractor certification.

E. Manufacturer's installation instructions for each product used.

F. Cured samples of exposed sealants for each color.

G. Manufacturer's Literature and Data:

1. Primers

2. Sealing compound, each type, including compatibility when different sealants are in contact with each other.

H. Manufacturer warranty.

1.6 PROJECT CONDITIONS:

A. Environmental Limitations:

1. Do not proceed with installation of joint sealants under following conditions:
 - a. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 4.4 degrees C (40 degrees F).
 - b. When joint substrates are wet.

B. Joint-Width Conditions:

1. Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.

C. Joint-Substrate Conditions:

1. Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

1.7 DELIVERY, HANDLING, AND STORAGE:

- A. Deliver materials in manufacturers' original unopened containers, with brand names, date of manufacture, shelf life, and material designation clearly marked thereon.
- B. Carefully handle and store to prevent inclusion of foreign materials.
- C. Do not subject to sustained temperatures exceeding 32 degrees C (90 degrees F) or less than 5 degrees C (40 degrees F).

1.8 DEFINITIONS:

- A. Definitions of terms in accordance with ASTM C717 and as specified.
- B. Backing Rod: A type of sealant backing.
- C. Bond Breakers: A type of sealant backing.
- D. Filler: A sealant backing used behind a back-up rod.

1.9 WARRANTY:

- A. Construction Warranty: Comply with FAR clause 52.246-21 "Warranty of Construction".
- B. Manufacturer Warranty: Manufacturer shall warranty their sealant for a minimum of five (5) years from the date of installation and final acceptance by the Government. Submit manufacturer warranty.

1.10 APPLICABLE PUBLICATIONS:

- A. Publications listed below form a part of this specification to extent referenced.

Publications are referenced in text by basic designation only.

- B. ASTM International (ASTM):

C509-06Elastomeric Cellular Preformed Gasket and Sealing
Material

C612-14Mineral Fiber Block and Board Thermal Insulation

C717-14aStandard Terminology of Building Seals and Sealants

C734-06(R2012)Test Method for Low-Temperature Flexibility of Latex
Sealants after Artificial Weathering

C794-10Test Method for Adhesion-in-Peel of Elastomeric Joint
Sealants

C919-12Use of Sealants in Acoustical Applications.

C920-14aElastomeric Joint Sealants.

C1021-08(R2014)Laboratories Engaged in Testing of Building Sealants

C1193-13Standard Guide for Use of Joint Sealants.

C1248-08(R2012)Test Method for Staining of Porous Substrate by Joint
Sealants

C1330-02(R2013)Cylindrical Sealant Backing for Use with Cold Liquid
Applied Sealants

C1521-13Standard Practice for Evaluating Adhesion of Installed
Weatherproofing Sealant Joints

D217-10Test Methods for Cone Penetration of Lubricating Grease

D1056-14Specification for Flexible Cellular Materials—Sponge or
Expanded Rubber

E84-09Surface Burning Characteristics of Building Materials

- C. Sealant, Waterproofing and Restoration Institute (SWRI).

The Professionals' Guide

- D. Environmental Protection Agency (EPA):

40 CFR 59(2014).....National Volatile Organic Compound Emission Standards
for Consumer and Commercial Products

PART 2 - PRODUCTS

2.1 SEALANTS:

A. Exterior Sealants:

1. S-#1 Vertical surfaces, provide non-staining ASTM C920, Type S or M, Grade NS, Class 25, Use NT.
2. S-#2 Horizontal surfaces, provide ASTM C920, Type S or M, Grade P, Class 25, Use T.
3. Provide location(s) of exterior sealant as follows:
 - a. Joints formed where frames and subsills of windows, doors, louvers, and vents adjoin masonry, concrete, or metal frames. Provide sealant at exterior surfaces of exterior wall penetrations.
 - b. Metal to metal.
 - c. Masonry to masonry or stone.
 - d. Stone to stone.
 - e. Cast stone to cast stone.
 - f. Masonry expansion and control joints.
 - g. Wood to masonry.
 - h. Masonry joints where shelf angles occur.
 - i. Voids where items penetrate exterior walls.
 - j. Metal reglets, where flashing is inserted into masonry joints, and where flashing is penetrated by coping dowels.

B. Floor Joint Sealant:

1. ASTM C920, Type S or M, Grade P, Class 25, Use T.
2. Provide location(s) of floor joint sealant as follows.
 - a. Seats of metal thresholds exterior doors.
 - b. Control and expansion joints in floors, slabs, ceramic tile, and walkways.

C. Interior Sealants:

1. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system are to comply with the following limits for VOC content when calculated according to 40 CFR 59, (EPA Method 24):
 - a. Architectural Sealants: 250 g/L.
 - b. Sealant Primers for Nonporous Substrates: 250 g/L.
 - c. Sealant Primers for Porous Substrates: 775 g/L.
 2. Vertical and Horizontal Surfaces: ASTM C920, Type S or M, Grade NS, Class 25, Use NT.
 3. Food Service: Use a Vinyl Acetate Homopolymer, or other low VOC, non-toxic sealant approved for use in food preparation areas.
 4. Provide location(s) of interior sealant as follows:
 - a. Typical narrow joint 6 mm, (1/4 inch or less at walls and adjacent components.
 - b. Perimeter of doors, windows, access panels which adjoin concrete or masonry surfaces.
 - c. Interior surfaces of exterior wall penetrations.
 - d. Joints at masonry walls and columns, piers, concrete walls or exterior walls.
 - e. Perimeter of lead faced control windows and plaster or gypsum wallboard walls.
 - f. Exposed isolation joints at top of full height walls.
 - g. Joints between bathtubs and ceramic tile; joints between shower receptors and ceramic tile; joints formed where nonplanar tile surfaces meet.
 - h. Joints formed between tile floors and tile base cove; joints between tile and dissimilar materials; joints occurring where substrates change.
 - i. Behind escutcheon plates at valve pipe penetrations and showerheads in showers.
- D. Acoustical Sealant:
1. Conforming to ASTM C919; flame spread of 25 or less; and a smoke developed rating of 50 or less when tested in accordance with ASTM E84. Acoustical sealant have a consistency of 250 to 310 when tested in accordance with ASTM D217; remain flexible and adhesive after 500 hours of accelerated weathering as specified in ASTM C734; and be non-staining.

2. Provide location(s) of acoustical sealant as follows:

- a. Exposed acoustical joint at sound rated partitions.
- b. Concealed acoustic joints at sound rated partitions.
- c. Joints where item pass-through sound rated partitions.

2.2 COLOR:

- A. Sealants used with exposed masonry are to match color of mortar joints.
- B. Sealants used with unpainted concrete are to match color of adjacent concrete.
- C. Color of sealants for other locations to be light gray or aluminum, unless otherwise indicated in construction documents.

2.3 JOINT SEALANT BACKING:

- A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C1330, of type indicated below and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
 - 1. Type C: Closed-cell material with a surface skin.
- C. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D1056 or synthetic rubber (ASTM C509), nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 32 degrees C (minus 26 degrees F). Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and otherwise contribute to optimum sealant performance.
- D. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.4 WEEPS:

A. Weep/Vent Products: Provide the following unless otherwise indicated or approved.

1. Round Plastic Tubing: Medium-density polyethylene, 3/8-inch OD by thickness of stone or masonry veneer.

2.5 FILLER:

- A. Mineral fiberboard: ASTM C612, Class 1.
- B. Thickness same as joint width.
- C. Depth to fill void completely behind back-up rod.

2.6 PRIMER:

- A. As recommended by manufacturer of caulking or sealant material.
- B. Stain free type.

2.7 CLEANERS-NON POROUS SURFACES:

- A. Chemical cleaners compatible with sealant and acceptable to manufacturer of sealants and sealant backing material. Cleaners to be free of oily residues and other substances capable of staining or harming joint substrates and adjacent non-porous surfaces and formulated to promote adhesion of sealant and substrates.

PART 3 - EXECUTION

3.1 INSPECTION:

- A. Inspect substrate surface for bond breaker contamination and unsound materials at adherent faces of sealant.
- B. Coordinate for repair and resolution of unsound substrate materials.
- C. Inspect for uniform joint widths and that dimensions are within tolerance established by sealant manufacturer.

3.2 PREPARATIONS:

- A. Prepare joints in accordance with manufacturer's instructions and SWRI (The Professionals' Guide).
- B. Clean surfaces of joint to receive caulking or sealants leaving joint dry to the touch, free from frost, moisture, grease, oil, wax, lacquer paint, or other foreign matter that would tend to destroy or impair adhesion.

1. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants.
2. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air. Porous joint surfaces include but are not limited to the following:
 - a. Concrete.
 - b. Masonry.
 - c. Unglazed surfaces of ceramic tile.
3. Remove laitance and form-release agents from concrete.
4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous surfaces include but are not limited to the following:
 - a. Metal.
 - b. Glass.
 - c. Porcelain enamel.
 - d. Glazed surfaces of ceramic tile.
- C. Do not cut or damage joint edges.
- D. Apply non-staining masking tape to face of surfaces adjacent to joints before applying primers, caulking, or sealing compounds.
 1. Do not leave gaps between ends of sealant backings.
 2. Do not stretch, twist, puncture, or tear sealant backings.
 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- E. Apply primer to sides of joints wherever required by compound manufacturer's printed instructions or as indicated by pre-construction joint sealant substrate test.
 1. Apply primer prior to installation of back-up rod or bond breaker tape.
 2. Use brush or other approved means that will reach all parts of joints. Avoid application to or spillage onto adjacent substrate surfaces.

3.3 BACKING INSTALLATION:

- A. Install backing material, to form joints enclosed on three sides as required for specified depth of sealant.
- B. Where deep joints occur, install filler to fill space behind the backing rod and position the rod at proper depth.
- C. Cut fillers installed by others to proper depth for installation of backing rod and sealants.
- D. Install backing rod, without puncturing the material, to a uniform depth, within plus or minus 1/8 inch for sealant depths specified.
- E. Where space for backing rod does not exist, install bond breaker tape strip at bottom (or back) of joint so sealant bonds only to two opposing surfaces.

3.4 SEALANT DEPTHS AND GEOMETRY:

- A. At widths up to 1/4 inch, sealant depth equal to width.
- B. At widths over 1/4 inch, sealant depth 1/2 of width up to 1/2 inch maximum depth at center of joint with sealant thickness at center of joint approximately 1/2 of depth at adhesion surface.

3.5 INSTALLATION:

- A. General:
 - 1. Apply sealants and caulking only when ambient temperature is between 5 degrees C and 38 degrees C (40 degrees and 100 degrees F).
 - 2. Do not install polysulfide base sealants where sealant may be exposed to fumes from bituminous materials, or where water vapor in continuous contact with cementitious materials may be present.
 - 3. Do not install sealant type listed by manufacture as not suitable for use in locations specified.
 - 4. Apply caulking and sealing compound in accordance with manufacturer's printed instructions.
 - 5. Avoid dropping or smearing compound on adjacent surfaces.

6. Fill joints solidly with compound and finish compound smooth.
 7. Tool exposed joints to form smooth and uniform beds, with slightly concave surface conforming to joint configuration per Figure 5A in ASTM C1193 unless shown or specified otherwise in construction documents. Remove masking tape immediately after tooling of sealant and before sealant face starts to "skin" over. Remove any excess sealant from adjacent surfaces of joint, leaving the working in a clean finished condition.
 8. Finish paving or floor joints flush unless joint is otherwise detailed.
 9. Apply compounds with nozzle size to fit joint width.
 10. Test sealants for compatibility with each other and substrate. Use only compatible sealant. Submit test reports.
 11. Replace sealant which is damaged during construction process.
- B. Weeps: Place weep holes and vents in joints where moisture may accumulate, including at base of cavity walls, above shelf angles, at all flashing, and as indicated on construction documents.
1. Use round plastic tubing to form weep holes.
 2. Space weep holes formed from plastic tubing not more than 16 inches o.c.
 3. Trim tubing material used in weep holes flush with exterior wall face after sealant has set.
- C. For application of sealants, follow requirements of ASTM C1193 unless specified otherwise. Take all necessary steps to prevent three-sided adhesion of sealants.
- D. Interior Sealants: Where gypsum board partitions are of sound rated, fire rated, or smoke barrier construction, follow requirements of ASTM C919 only to seal all cut-outs and intersections with the adjoining construction unless specified otherwise.
1. Apply a 1/4 inch minimum bead of sealant each side of runners (tracks), including those used at partition intersections with dissimilar wall construction.
 2. Coordinate with application of gypsum board to install sealant immediately prior to application of gypsum board.

3. Partition intersections: Seal edges of face layer of gypsum board abutting intersecting partitions, before taping and finishing or application of veneer plaster-joint reinforcing.
4. Openings: Apply a 1/4 inch bead of sealant around all cutouts to seal openings of electrical boxes, ducts, pipes and similar penetrations. To seal electrical boxes, seal sides and backs.
5. Control Joints: Before control joints are installed, apply sealant in back of control joint to reduce flanking path for sound through control joint.

3.6 FIELD QUALITY CONTROL:

- A. Field-Adhesion Testing: Field-test joint-sealant adhesion to joint substrates according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521.
 1. Extent of Testing: Test completed elastomeric sealant joints as follows:
 - a. Perform 10 tests for first 1000 feet of joint length for each type of elastomeric sealant and joint substrate.
 - b. Perform one test for each 1000 feet of joint length thereafter or one test per each floor per elevation.
- B. Inspect joints for complete fill, for absence of voids, and for joint configuration complying with specified requirements. Record results in a field adhesion test log.
- C. Inspect tested joints and report on following:
 1. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate.
 2. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.
 3. Whether sealants filled joint cavities and are free from voids.
 4. Whether sealant dimensions and configurations comply with specified requirements.

- D. Record test results in a field adhesion test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
- E. Repair sealants pulled from test area by applying new sealants following same procedures used to originally seal joints. Ensure that original sealant surfaces are clean and new sealant contacts original sealant.
- F. Evaluation of Field-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements, will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.7 CLEANING:

- A. Fresh compound accidentally smeared on adjoining surfaces: Scrape off immediately and rub clean with a solvent as recommended by manufacturer of the adjacent material or if not otherwise indicated by the caulking or sealant manufacturer.
- B. Leave adjacent surfaces in a clean and unstained condition.

--- E N D ---

SECTION 08 11 13
HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Hollow metal doors hung in hollow metal frames at interior and exterior locations.
 - 2. Hollow metal door frames for wood doors at interior locations.
 - 3. Glazed openings and louvers in hollow metal doors.

1.2 RELATED REQUIREMENTS

- A. Frames fabricated of structural steel: Section 05 50 00, METAL FABRICATIONS.
- B. Forced Entry and Ballistic Resistant doors: Section 08 34 53, SECURITY DOORS AND FRAMES.
- C. Aluminum frames entrance work: Section 08 41 13, ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS.
- D. Door Hardware: Section 08 71 00, DOOR HARDWARE.
- E. Glazing: Section 08 80 00, GLAZING.
- F. Card Readers and Biometric Devices: Section 28 13 00, PHYSICAL ACCESS CONTROL SYSTEM.
- G. Intrusion Alarm: Section 28 16 00, INTRUSION DETECTION SYSTEM.
- H. Security Monitors: Section 28 23 00, VIDEO SURVEILLANCE.

1.3 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. American National Standard Institute (ANSI):
 - 1. A250.8-2014 - Standard Steel Doors and Frames.
- C. ASTM International (ASTM):
 - 1. A240/A240M-15b - Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.

2. A653/A653M-15 - Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip.
 3. A1008/A1008M-15 - Steel, Sheet, Cold-Rolled, Carbon, Structural, High Strength Low Alloy and High Strength Low Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.
 4. B209-14 - Aluminum and Aluminum-Alloy Sheet and Plate.
 5. B209M-14 - Aluminum and Aluminum-Alloy Sheet and Plate (Metric).
 6. B221-14 - Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
 7. B221M-13 - Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).
 8. D3656/D3656M-13 - Insect Screening and Louver Cloth Woven from Vinyl Coated Glass Yarns.
 9. E90-09 - Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
- D. Federal Specifications (Fed. Spec.):
1. L-S-125B - Screening, Insect, Nonmetallic.
- E. Master Painters Institute (MPI):
1. No. 18 - Primer, Zinc Rich, Organic.
- F. National Association of Architectural Metal Manufacturers (NAAMM):
1. AMP 500-06 - Metal Finishes Manual.
- G. National Fire Protection Association (NFPA):
1. 80-16 - Fire Doors and Other Opening Protectives.
- H. UL LLC (UL):
1. 10C-09 - Positive Pressure Fire Tests of Door Assemblies.
 2. 1784-15 - Air Leakage Tests of Door Assemblies and Other Opening Protectives.

1.4 SUBMITTALS

- A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Submittal Drawings:
 - 1. Show size, configuration, and fabrication and installation details.
- C. Manufacturer's Literature and Data:
 - 1. Description of each product.
 - 2. Include schedule showing each door and frame requirements fire label and smoke control label for openings.
 - 3. Installation instructions.
- D. Sustainable Construction Submittals:
 - 1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.
- E. Test reports: Certify each product complies with specifications.
 - 1. Sound rated door.
- F. Qualifications: Substantiate qualifications comply with specifications.
 - 1. Manufacturer

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 - 1. Regularly manufactures specified products.
 - 2. Manufactured specified products with satisfactory service on five similar installations for minimum five years.

1.6 DELIVERY

- A. Fasten temporary steel spreaders across the bottom of each door frame before shipment.
- B. Deliver products in manufacturer's original sealed packaging.
- C. Mark packaging, legibly. Indicate manufacturer's name or brand, type, production run number, and manufacture date.

- D. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.7 STORAGE AND HANDLING

- A. Store products indoors in dry, weathertight facility.
- B. Protect products from damage during handling and construction operations.

1.8 WARRANTY

- A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

- A. Design hollow metal doors and frames complying with specified performance:
 - 1. Fire Doors and Frames: UL 10C; NFPA 80 labeled.
 - a. Fire Ratings: See drawings.
 - 2. Stair Doors: Temperature rise rated fire doors.
 - 3. Smoke Control Doors and Frames: UL 1784; NFPA 80 labeled, maximum 3.0 cfm/sf at 24.9 Pa (0.10 inches water gage) pressure differential.
 - 4. Sound Rated Doors and Frames: Minimum 45 sound transmission class (STC) when tested according to ASTM E90.
 - 5. Blast Resistance:
 - a. Door panels shall swing outward toward the exterior or interior high risk space (i.e, lobby/waiting area) and be constructed of a minimum 14GA steel.
 - b. Door panel shall bear on a continuous door stop at three sides.
 - c. Door stop and frame shall be attached to supporting jamb and header elements based on the lesser of the following:
 - 1) Linear decaying blast load time-history of peak pressure, $P = 4\text{psi}$ and load duration, $t_d = 14\text{ msec.}$ applied to the door panel
 - 2) Door panel ultimate resistance based on a uniform pressure load (i.e., reaction force based on door panel plastic moment capacity)

2.2 MATERIALS

- A. Stainless Steel: ASTM A240/A240M; Type 304
- B. Sheet Steel: ASTM A1008/A1008M, cold-rolled.
- C. Galvanized Sheet Steel: ASTM A653.
- D. Insect Screening: ASTM D3656/D3656M, 18 by 18 aluminum wire mesh.
- E. Aluminum Sheet: ASTM B209M (ASTM B209).
- F. Aluminum Extrusions: ASTM B221M (ASTM B221).

2.3 PRODUCTS - GENERAL

- A. Basis of Design: Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Provide hollow metal doors and frames from one manufacturer.
- C. Sustainable Construction Requirements:
 - 1. Steel Recycled Content: 30 percent total recycled content, minimum.
 - 2. Stainless Steel Recycled Content: 70 percent total recycled content, minimum.
 - 3. Aluminum Recycled Content: 80 percent total recycled content, minimum.

2.4 HOLLOW METAL DOORS

- A. Hollow Metal Doors: ANSI A250.8; 1-3/4 inches thick. See drawings for sizes and designs.
 - 1. Interior Doors: Level 1 and Physical Performance Level C, standard duty; Model 2, seamless
 - 2. Interior Doors: Level 3 and Physical Performance Level A, extra-heavy duty; Model 2, seamless at stairs, detention, and security, locations.
 - 3. Exterior Doors: Level 4 and Physical Performance Level A, maximum heavy duty; Model 2, seamless
- B. Door Faces:
 - 1. Interior Doors: Galvanized sheet steel minimum Z120 or ZF120 (G40 or A40)
 - 2. Exterior Doors: Stainless steel Z120 or ZF120 (G40 or A40) coating.
- C. Door Cores:
 - 1. Interior Doors: Kraft paper honeycomb

2. Exterior Doors: Polystyrene or polyurethane.
3. Fire Doors: Manufacturer's standard complying with specified fire rating performance.

2.5 HOLLOW METAL FRAMES

- A. Hollow Metal Frames: ANSI A250.8; See drawings for sizes and designs.
 1. Interior Frames:
 - a. Level 1 Hollow Metal Doors: 0.042 inch thick.
 - b. Level 2 and Level 3 Hollow Metal Doors: 0.053 inch thick.
 2. Interior Borrowed Light Frames: 0.051 inch thick.
 3. Interior Frames for Lead Lined Doors:
 - a. Openings with Structural Steel Subframe: 0.053 inch thick.
 - b. Lead Lining: See Section 13 49 00, RADIATION PROTECTION.
 - c. Interior Automatic Operator Door Frames: 0.067 inch thick.
 - d. Interior Detention Door Frames: Minimum 0.093 inch thick.
 - e. Exterior Frames:
 - 1) Level 3 Hollow Metal Doors: 0.053 inch thick.
 - 2) Level 4 Hollow Metal Doors: 0.067 inch thick.
- B. Frame Materials:
 1. Interior Frames: Galvanized sheet steel minimum Z120 or ZF120 (G40 or A40)
 2. Exterior Frames: Galvanized sheet steel minimum Z120 or ZF120 (G40 or A40)

2.6 LOUVERS

- A. Louver Style: Sight-proof permitting free ventilation.
 1. Provide insect screen and wire guards at exterior doors.
- B. Louver Construction: Sheet metal matching door faces.
 1. Interior Door Louvers: 0.032 inch thick.
 2. Exterior Door Louvers: 0.053 inch thick.

2.7 FABRICATION

- A. Hardware Preparation: ANSI A250.8; for hardware specified in Section 08 71 00, DOOR HARDWARE.
- B. Hollow Metal Door Fabrication:
 - 1. Close top edge of exterior doors flush and seal to prevent water intrusion.
 - 2. Fill spaces between vertical steel stiffeners with insulation.
- C. Fire Doors:
 - 1. Close top and vertical edges flush.
 - 2. Apply steel astragal to active leaf at pair and double egress doors.
 - a. Exception: Where vertical rod exit devices are specified for both leaves swinging in same direction.
 - 3. Fire Door Clearances: NFPA 80.
- D. Custom Metal Hollow Doors:
 - 1. Provide custom hollow metal doors where nonstandard steel doors are shown on drawings.
 - a. Provide door sizes, design, materials, construction, gages, and finish as specified for standard steel doors.
- E. Dutch Doors:
 - 1. Construct as two independent door leaves.
 - 2. Fabricate shelves from minimum 0.053 inch thick steel.
 - a. Size: See drawings.
 - 3. Fabricate brackets from same metal as shelves.
 - 4. Weld, bolt, or screw-attach shelves and brackets to door.
- F. Sound Rated Doors:
 - 1. Seals: Integral spring type automatic door bottom seal.
 - 2. Fabricate vision panel cutouts and frames to receive double glazing as shown on drawings.
- G. Detention Doors:

1. Vision panels:
 - a. Weld 1/8 inch thick steel channel reinforcements around cut-outs in doors to accommodate vision lights.
 - b. Fabricate glazing stops on room side of doors, of 1/8 inch thick steel sheets mitered and welded at corners, and continuously welded both sides into doors.
 - c. Fabricate glazing bead for corridor side of doors of 3/8 inch by 3/4 inch steel bar, miter and weld at the corners, and fasten to doors with 1/4 inch countersunk screws near corners and centers of both sides of opening.
 - 1) Back-up screw holes with 1/8 inch thick reinforcements or weld nuts to back of frames to receive screws.
 - d. Size rabbet for safety glass and glazing cushions specified.
- H. Transom Panel Fabrication:
 1. Fabricate panels as specified for doors.
 2. Fabricate bottom edge with rabbet stop where no transom bar occurs.
- I. Hollow Metal Frame Fabrication:
 1. Fasten mortar guards to back of hardware reinforcements, except on lead-lined frames.
 2. Concealed Closers in Head Frame: Provide 0.042 inch thick steel removable stop sections for access to concealed face plates and control valves, except when cover plates are furnished with closer.
 3. Terminated Stops: ANSI A250.8.
 4. Frame Anchors:
 - a. Floor anchors:
 - 1) Provide extension type floor anchors to compensate for depth of floor fills.
 - 2) Provide 0.053 inch thick steel clip angles welded to jamb and drilled to receive floor fasteners.
 - 3) Provide 2 inch by 2 inch by 3/8 inch clip angle for lead lined frames, drilled for floor fasteners.

- 4) Provide mullion 0.093 inch thick steel channel anchors, drilled for two floor fasteners and frame anchor screws.
- 5) Provide continuous 0.042 inch thick steel rough bucks drilled for floor fasteners and frame anchor screws for sill sections.
 - a) Space floor bolts 24 inches on center.
- b. Jamb anchors:
 - 1) Place anchors on jambs:
 - a) Near top and bottom of each frame.
 - b) At intermediate points at maximum 24 inches spacing.
 - 2) Form jamb anchors from steel minimum 0.042 inch thick.
 - 3) Anchors set in masonry: Provide adjustable anchors designed for friction fit against frame and extended into masonry minimum 10 inches. Provide one of following types:
 - a) Wire Loop Type: 3/16 inch diameter wire.
 - b) T-Shape type.
 - c) Strap and stirrup type: Corrugated or perforated sheet steel.
 - 4) Anchors for stud partitions: Provide tabs for securing anchor to sides of studs. Provide one of the following:
 - a) Welded type.
 - b) Lock-in snap-in type.
 - 5) Anchors for frames set in prepared openings:
 - a) Steel pipe spacers 1/4 inch inside diameter, welded to plate reinforcing at jamb stops, or hat shaped formed strap spacers 2 inches wide, welded to jamb near stop.
 - b) Drill jamb stop and strap spacers for 1/4 inch flat head bolts to pass through frame and spacers.
 - c) Two piece frames: Subframe or rough buck drilled for 1/4 inch bolts.

- 6) Anchors for observation windows and other continuous frames set in stud partitions.
 - a) Weld clip anchors to sills and heads of continuous frames over 4 feet long.
 - b) Space maximum 24 inches on centers.
 - 7) Modify frame anchors to fit special frame and wall construction.
 - 8) Provide special anchors where shown on drawings and where required to suit application.
- J. Sound Rated Door Frames:
- 1. Seals: Integral continuous gaskets on frames.
- K. Louver Fabrication:
- 1. Fabricate louvers as complete units.
 - 2. Weld stationary blades to frames.
 - 3. Factory install louvers in door cutouts, welded to door.
- L. Louver Screen Fabrication:
- 1. Fabricate frame to hold wire fabric in channel with retaining bar anchor and to mount on surface of door with screws.
 - 2. Do not lap frame over louver opening.
 - 3. Miter frame corners and join by concealed mechanical fastenings extending about 2-1/4 inches into ends of each member.
 - 4. Drill frame and doors for screw attachment:
 - a. Space screws 2 inches from end of each leg of frame and maximum 12 inches on center.
 - 5. Insect Screens: Fasten insect screens to interior side of doors with retaining bar against door and not exposed to view.
 - 6. Wire Guards: Fasten wire guard to exterior side of door with retaining bar against door and not exposed to view.

2.8 FINISHES

- A. Steel and Galvanized Steel: ANSI A250.8; shop primed.
- B. Stainless Steel: NAAMM AMP 500; No. 4 polished finish.
 - 1. Blend welds to match adjacent finish.
- C. Finish exposed surfaces after fabrication.
- D. Aluminum Anodized Finish: NAAMM AMP 500.
 - 1. Clear Anodized Finish: AA-C22A41; Class I Architectural, 0.7 mil thick.
 - 2. Color Anodized Finish: AA-C22A42 or AA-C22A44; Class I Architectural, 0.7 mil thick.
 - 3. Clear Anodized Finish: AA-C22A31; Class II Architectural, 0.4 mil thick.
 - 4. Color Anodized Finish: AA-C22A32 or AA-C22A34; Class II Architectural, 0.4 mil thick.

2.9 ACCESSORIES

- A. Primers: ANSI A250.8.
- B. Barrier Coating: ASTM D1187/D1187M.
- C. Welding Materials: AWS D1.1/D1.1M, type to suit application.
- D. Clips Connecting Members and Sleeves: Match door faces.
- E. Fasteners: Galvanized steel
 - 1. Metal Framing: Steel drill screws.
 - 2. Masonry and Concrete: Expansion bolts and power actuated drive pins.
- F. Anchors: Galvanized steel
- G. Galvanizing Repair Paint: MPI No. 18.
- H. Insulation: Unfaced mineral wool.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine and verify substrate suitability for product installation.
- B. Protect existing construction and completed work from damage.

- C. Apply barrier coating to metal surfaces in contact with cementitious materials to minimum 30 mils dry film thickness.

3.2 INSTALLATION - GENERAL

- A. Install products according to manufacturer's instructions and approved submittal drawings.
 - 1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.
 - 2. Install fire doors and frames according to NFPA 80.
 - 3. Install smoke control doors and frames according to NFPA 105.

3.3 FRAME INSTALLATION

- A. Apply barrier coating to concealed surfaces of frames built into masonry.
- B. Plumb, align, and brace frames until permanent anchors are set.
 - 1. Use triangular bracing near each corner on both sides of frames with temporary wood spreaders at midpoint.
 - 2. Use wood spreaders at bottom of frame when shipping spreader is removed.
 - 3. Where construction permits concealment, leave shipping spreaders in place after installation, otherwise remove spreaders when frames are set and anchored.
 - 4. Remove wood spreaders and braces when walls are built and jamb anchors are secured.
- C. Floor Anchors:
 - 1. Anchor frame jambs to floor with two expansion bolts.
 - a. Lead Lined Frames: Use 3/8 inch diameter bolts.
 - b. Other Frames: Use 1/4 inch diameter bolts.
 - 2. Power actuated drive pins are acceptable to secure frame anchors to concrete floors.
- D. Jamb Anchors:
 - 1. Masonry Walls:
 - a. Embed anchors in mortar.

- b. Fill space between frame and masonry with grout or mortar as walls are built.
- 2. Metal Framed Walls: Secure anchors to sides of studs with two fasteners through anchor tabs.
- 3. Prepared Masonry and Concrete Openings:
 - a. Direct Securement: 1/4 inch diameter expansion bolts through spacers.
 - b. Subframe or Rough Buck Securement:
 - 1) 1/4 inch diameter expansion bolts on 24 inch centers.
 - 2) Power activated drive pins on 24 inches centers.
 - c. Secure two-piece frames to subframe or rough buck with machine screws on both faces.
- E. Frames for Sound Rated Doors: Fill frames with insulation.
- F. Lead Lined Frames:
 - 1. Extend jambs and anchor with clip angles to structure above.
 - a. Fasteners to Concrete: Minimum two, 3/8 inch diameter expansion bolts or power actuated drive pins
 - b. Connection to Structural Steel: Welded.
- G. Touch up damaged factory finishes.
 - 1. Repair galvanized surfaces with galvanized repair paint.
 - 2. Repair painted surfaces with touch up primer.

3.4 DOOR INSTALLATION

- A. Install doors plumb and level.
- B. Adjust doors for smooth operation.
- C. Touch up damaged factory finishes.
 - 1. Repair galvanized surfaces with galvanized repair paint.
 - 2. Repair painted surfaces with touch up primer.

3.5 CLEANING

- A. Clean exposed door and frame surfaces. Remove contaminants and stains.

3.6 PROTECTION

- A. Protect doors and frames from traffic and construction operations.
- B. Remove protective materials immediately before acceptance.
- C. Repair damage.

--- E N D ---

**SECTION 08 14 00
INTERIOR WOOD DOORS**

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Interior flush wood doors painted finish.
 - a. Fire rated doors.
 - b. Smoke rated doors.
 - c. Acoustical doors.
 - d. Dutch doors.
 - 2. Interior stile and rail wood doors painted finish.

1.2 RELATED REQUIREMENTS

- A. Paints and Coatings and Composite Wood and Agrifiber VOC Limits: Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.
- B. Door Hardware including hardware location (height): Section 08 71 00, DOOR HARDWARE.
- C. Installation of Doors and Hardware: Section 08 11 13, HOLLOW METAL DOORS AND FRAMES Section 08 71 00, DOOR HARDWARE.
- D. Door Finish: Section 09 06 00, SCHEDULE FOR FINISHES.

1.3 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. American National Standards Institute/Window and Door Manufacturers Association (ANSI/WDMA):
 - 1. I.S. 1A-13 - Architectural Wood Flush Doors.
 - 2. I.S. 6A-13 - Interior Architectural Stile and Rails Doors.
- C. ASTM International (ASTM):
 - 1. E90-09 - Laboratory Measurements of Airborne Sound Transmission Loss of Building Partitions and Elements.

- D. National Fire Protection Association (NFPA):
 - 1. 80-16 - Fire Doors and Other Opening Protectives.
 - 2. 252-12 - Fire Tests of Door Assemblies.
- E. UL LLC (UL):
 - 1. 10C-09 - Positive Pressure Fire Tests of Door Assemblies.
- F. Window and Door Manufacturers Association (WDMA):
 - 1. TM 7-14 - Cycle-Slam Test.
 - 2. TM 8-14 - Hinge Loading Test.
 - 3. TM 10-14 - Screw Holding Capacity.

1.4 SUBMITTALS

- A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Submittal Drawings:
 - 1. Show size, configuration, and fabrication and installation details.
 - 2. Include details of glazing
 - 3. Indicate project specific requirements not included in Manufacturer's Literature and Data submittal.
- C. Manufacturer's Literature and Data:
 - 1. Description of each product.
 - 2. Fire rated doors showing conformance with NFPA 80
- D. Samples:
 - 1. Corner section of flush veneered door 12 inches square, showing details of construction, labeled to show grade and type number and conformance to specified standard.
- E. Sustainable Construction Submittals:
 - 1. Low Pollutant-Emitting Materials:
 - a. Show volatile organic compound types and quantities.
- F. Test Reports: Indicate each product complies with specifications.

1. Screw Holding Capacity Test.
 2. Cycle-Slam Test.
 3. Hinge-Loading Test.
- G. Operation and Maintenance Data:
1. Care instructions for each exposed finish product.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
1. Regularly and presently manufactures specified products.
 2. Manufactures specified products with satisfactory service on five similar installations for minimum five years.

1.6 DELIVERY

- A. Deliver products in manufacturer's original sealed packaging.
1. Minimum 6 mil polyethylene bags or cardboard packaging to remain unbroken during delivery and storage.
- B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, color, and manufacture date.
1. Identify door opening corresponding to Door Schedule.
- C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.7 STORAGE AND HANDLING

- A. Store products indoors in dry, weathertight facility.
1. Store doors according to ANSI/WDMA I.S. 1A.
- B. Protect products from damage during handling and construction operations.

1.8 FIELD CONDITIONS

- A. Environment:
1. Product Temperature: Minimum 21 degrees C (70 degrees F) for minimum 48 hours before installation.

2. Work Area Ambient Temperature Range: 21 to 27 degrees C (70 to 80 degrees F) continuously, beginning 48 hours before installation.
3. Install products when building is permanently enclosed and when wet construction is completed, dried, and cured.
 - a. Comply with door manufacturer's instructions for relative humidity.

1.9 WARRANTY

- A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."
- B. Manufacturer's Warranty: Warrant interior factory finished flush wood doors against material and manufacturing defects.
 1. Warranty Period: Lifetime of original installation.

PART 2 - PRODUCTS

2.1 PRODUCTS - GENERAL

- A. Basis of Design: Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Provide each product from one manufacturer.
- C. Sustainable Construction Requirements:
 1. Low Pollutant-Emitting Materials: Comply with VOC limits specified in Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS for the following products:
 - a. Paints and coatings.
 - b. Composite wood and agrifiber.

2.2 FLUSH WOOD DOORS

- A. General:
 1. ANSI/WDMA I.S. 1A, Extra Heavy Duty.
 2. Adhesive: Type II.
 3. Core: Structural composite lumber, except when mineral core is required for fire rating.
 4. Thickness: 1-3/4 inches unless otherwise shown or specified.
- B. Faces:

1. ANSI/WDMA I.S. 1A.
 2. One species throughout project unless scheduled or otherwise shown.
 3. Transparent Finished Faces: Premium Grade. Quarter cut, Cherry
 - a. A Grade face veneer.
 - b. Match between veneer leaves: Slip Match
 - c. Assembly of veneer leaves on door faces: Balance
 - d. Exposed Vertical and Top Edges: Same species as faces - edge Type A
 4. Painted Finishes: Custom Grade, mill option close grained hardwood, premium or medium density overlay.
 5. Factory sand doors for finishing.
- C. Wood For Stops, Louvers, Muntins and Moldings For Flush Doors Required to Have Transparent Finish:
1. Solid wood of same species as face veneer, except maple is acceptable on birch doors.
 2. Glazing:
 - a. On non-fire-rated doors, use applied wood stops nailed tightly on room side and attached on opposite side with flathead, countersunk wood screws, spaced approximately 5 inches on center.
 3. Wood Louvers:
 - a. Door manufacturer's standard product, fabricated of solid wood sections.
 - b. Wood Slats: minimum 3/16 inch thick.
 - c. Stiles routed out to receive slats.
 - d. Secure louvers in prepared cutouts with wood stops.
- D. Stiles and Rails:
1. Composite material having screw withdrawal force greater than minimum performance level value when tested according to WDMA TM 10.
 2. Provide adequate blocking for bottom of doors having mechanically operated door bottom seal meeting or exceeding performance duty level per WDMA TM 10 for horizontal door edge screw holding.

3. Rabbeted transom meeting rail edges match face veneers of doors.
- E. Fire-Rated Wood Doors:
1. Fire Resistance Rating:
 - a. B Label: 1-1/2 hours.
 - b. C Label: 3/4 hour.
 2. Labels:
 - a. Comply with NFPA 252, UL 10C, and labeled by qualified testing and inspection agency showing fire resistance rating.
 - b. Metal labels with raised or incised markings.
 3. Performance Criteria for Stiles of Doors Utilizing Standard Mortise Leaf Hinges:
 - a. Hinge Loading: WDMA TM 8. Average of 10 test samples for Extra Heavy Duty doors.
 - b. Direct Screw Withdrawal: WDMA TM 10 for Extra Heavy Duty doors. Average of 10 test samples using a steel, fully threaded #12 wood screw.
 - c. Cycle-Slam: 1,000,000 cycles with no loose hinge screws or other visible signs of failure when tested according to WDMA TM 7.
 4. Hardware Reinforcement:
 - a. Provide fire rated doors with hardware reinforcement blocking.
 - b. Size of lock blocks as required to secure hardware specified.
 - c. Top, Bottom and Intermediate Rail Blocks: Minimum 5 inches by full core width.
 - d. Reinforcement blocking in compliance with labeling requirements.
 - e. Mineral material similar to core is not acceptable.
 5. Other Core Components: Manufacturer's standard as allowed by labeling requirements.
 6. Glazed Vision Panel Frame: Steel approved for use in labeled doors.
 7. Astragal: Steel type for pairs of doors.
- F. Smoke Barrier Doors:
1. Glazed Vision Panel Frame: Steel approved for use in labeled doors.

2. Astragal: Steel type for pairs of doors, including double egress doors.

G. Sound Rated Doors:

1. Fabricated as specified for flush wood doors with additional construction requirements to comply with specified sound transmission class (STC).
2. STC Rating of door assembly in place when tested according to ASTM E90 by independent acoustical testing laboratory minimum 35
3. Accessories:
 - a. Frame Gaskets and Automatic Door Bottom Seal: As specified in Section 08 71 00, DOOR HARDWARE.

H. Dutch Doors:

1. Consist of two sections, each fabricated as specified for flush doors.
2. Construct shelf as detailed, from clear hardwood stock of same species as face veneer of door.
3. Place shelf on top of lower section of door and support as shown with a pair of wood or wrought steel brackets.
4. Prime steel brackets for finish painting.

2.3 FABRICATION

- A. Factory machine interior wood doors to receive hardware, bevels, undercuts, cutouts, accessories and fitting for frame.
 1. Factory fit fire rated doors according to NFPA 80.
- B. Rout doors for hardware using templates and location heights specified in Section 08 71 00, DOOR HARDWARE.
- C. Factory fit doors to frame, bevel lock edge of doors 1/8 inch for each 2 inches of door thickness undercut where shown.
- D. Clearances between Doors and Frames and Floors:
 1. Fire Rated Doors: Comply with NFPA 80.
 - a. Doors with Automatic Bottom Seal: Maximum clearance 3/8 inch at threshold.

- b. Other Door Bottoms: Maximum 1/8 inch clearance at the jambs, heads, and meeting stiles, and a 3/4 inch clearance at bottom, except as otherwise specified.
- 2. Door Jambs, Heads, and Meeting Stiles: Maximum 1/8 inch.
- E. Provide cutouts for glazed and louver openings.
- F. Finish surfaces, including both faces, top and bottom and edges of the doors smooth to touch.
- G. Identify each door on top edge.
 - 1. Mark with stamp, brand or other indelible mark, giving manufacturer's name, door's trade name, construction of door, date of manufacture and quality.
 - 2. Mark door or provide separate certification including name of inspection organization.
 - 3. Identify door manufacturing standard, including glue type.
 - 4. Identify veneer and quality certification.
 - 5. Identification of preservative treatment for stile and rail doors.

2.4 FINISHES

- A. Field Finished Doors: Seal top and bottom edges of doors with two coats of catalyzed polyurethane or water resistant sealer.
- B. Factory Transparent Finish:
 - 1. Factory finish flush wood doors.
 - a. ANSI/WDMA I.S. 1A Section F-3 Finish System Descriptions for System 5, Conversion Varnish or System 7, Catalyzed Vinyl.
 - b. Use stain when required to produce finish specified in Section 09 06 00, SCHEDULE FOR FINISHES.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine and verify substrate suitability for product installation.
 - 1. Verify door frames are properly anchored.

2. Verify door frames are plumb, square, in plane, and within tolerances for door installation.
- B. Protect existing construction and completed work from damage.
- C. Install astragal on active leaf of pair of smoke doors and one leaf of double egress smoke doors.

3.2 INSTALLATION

- A. Install products according to manufacturer's instructions and approved submittal drawings.
 1. Install fire rated doors according to NFPA 80.
 2. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.

3.3 PROTECTION

- A. After installation, place shipping container over door and tape in place.
 1. Do not apply tape to door faces and edges.
- B. Provide protective covering over exposed hardware in addition to covering door.
- C. Maintain covering in good condition until removal is directed by Contracting Officer's Representative.

-- E N D --

SECTION 08 14 73
INTERIOR SLIDING DOORS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Factory fabricated interior sliding door frame and track systems with operating hardware.

1.02 RELATED REQUIREMENTS

- A. Section 087100 - Door Hardware.
- B. Section 088000 - Glazing: Product and execution requirements for glass type and installation.

1.03 REFERENCE STANDARDS

- A. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document) 2015.
- B. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum 2014 (2015 Errata).
- 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.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide component dimensions, information on glass and glazing, and descriptions of hardware and accessories.
- C. Shop Drawings: Indicate opening dimensions, elevations of different types, framed opening tolerances, and installation requirements.
- D. Samples: Submit two samples, 12 inches (305 mm) long indicating typical sliding door frame construction, accessories, and finishes.
- E. Certificate: Certify that sliding glass doors meet or exceed specified requirements.
- F. Manufacturer's Installation Instructions: Include complete preparation, installation, and cleaning requirements.
- G. Manufacturer's qualification statement.
- H. Installer's qualification statement.
- I. Warranty, executed in Owner's name.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of type specified in this section, with at least three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to project site and store in manufacturer's protective cartons until openings are ready for door installation.

1.07 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Correct defective work within a two year period after Date of Substantial Completion.
- C. Provide tyear manufacturer warranty against excessive degradation of metal finishes, and include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Interior Sliding Doors:
 - 1. Serenity Sliding Door Systems; SD101 - Surface Mounted Single Sliding:
www.serenityslidingdoor.com/#sle. OR APPROVED ALTERNATE
- A. Serenity Master Spec 083006 - 2 Interior Sliding Doors - Serenity

2.02 SLIDING DOOR TRACK SYSTEMS

- A. Type SD101 - Interior Sliding Door Track Systems:
 - 1. Description: Aluminum-cased frame that wraps wall at jambs and head of opening with trim; includes face trim at track, receiving channel, adjustable top track assembly, carriage assemblies having weight rating of at least 220 lb (99.8 kg), frames with integral double seal full gasketing, soft close units, receiving channel, brush type seals, and factory-prepped locks. Privacy Deadlock w/ ADA thumbturn and Occupancy Indicator along with Acoustic Door Bottom semi-mortised on the inside of the exam room. Serenity offers a STC-35 equivalent rating. (NIC 40 rating)
 - 2. Configuration: On wall surface-mount system as indicated on drawings.
 - 3. Frame Finish: Class I natural anodized (Standard).

4. Door Type: Flush wood door with particleboard core (Standard).
5. Wood Door Veneer: As selected by Architect.
 - a. Provide stained finish as selected by Architect.
6. Door Thickness: 1-3/4 inches (44.5 mm).
7. Wall Thickness: 4-7/8 inches (123.8 mm), with 5 inch (127 mm) wide cased open frame.
8. Door Lites: Flush, no lite.

2.03 COMPONENTS

2.04 PERFORMANCE REQUIREMENTS

- A. Acoustical Performance: Provide door assembly and components with Sound Transmission Class (STC) rating of 35, minimum, when tested in accordance with ASTM E90, and ratings derived from ASTM E413.

2.05 ASSEMBLY

- A. Provide wall blocking within metal stud walls as required by manufacturer of sliding door assembly.
- B. Joints and Connections: Flush, hairline width, and waterproof; accurately and rigidly joined corners.

2.06 FINISHES

- A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 clear anodic coating not less than 0.7 mils (0.018 mm) thick.

2.07 ACCESSORIES

- A. Blocking: Provide support wall blocking as required for sliding door locations in accordance with sliding door manufacturer's requirements.

PART 3 EXECUTION

2.03 EXAMINATION

- A. Verify that openings are ready to receive work and opening dimensions and clearances are as indicated on approved shop drawings.

3.02 PREPARATION

- A. Prepare opening to permit correct installation of door unit as indicated.

3.03 INSTALLATION

- A. Install sliding door units in accordance with manufacturer's instructions.
- B. Use anchorage devices to securely fasten sliding door assembly to wall construction

without distortion or imposed stresses.

- B. Install perimeter trim and interior closures.

3.04 TOLERANCES

- A. Maintain dimensional tolerances and alignment with adjacent work.
- B. Maximum Variation from Plumb: 1/16 inch (1.6 mm).
- C. Maximum Variation from Level: 1/16 inch (1.6 mm).
- D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch (3.2 mm) from 10 foot (3 m) straight edge.

3.05 ADJUSTING

- A. Adjust hardware for smooth operation.

3.06 CLEANING

- A. Remove protective material from factory finished surfaces.
- B. Remove labels and visible markings.
- C. Wash surfaces by method recommended and acceptable to sealant and sliding door manufacturer; rinse and wipe surfaces clean.
- D. See Section 017419 - Construction Waste Management and Disposal, for additional requirements.

3.07 PROTECTION

- A. Protect installed products from damage until Date of Substantial Completion.

---END OF SECTION---

SECTION 08 17 10
INTEGRATED DOOR ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Integrated door assemblies including metal door frame, door, and hardware, unless specified in another Section, installed at cross-corridor locations.
- B. Smoke and draft control seals, unless specified in another Section.

1.2 RELATED REQUIREMENTS

- A. Non-Flooring Adhesives and Sealants and Paints and Coatings VOC Limits: Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.
- B. Lock Cylinders: Section 08 71 00, DOOR HARDWARE.
- C. Automatic Door Operators: Section 08 71 13, AUTOMATIC DOOR OPERATORS.
- D. Door and Frame Color: Section 09 06 00, SCHEDULE FOR FINISHES.
- E. Electrical Power: DIVISION 26, ELECTRICAL.

1.3 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. Builders Hardware Manufacturers Association (BHMA):
 - 1. A156.3-14 - Exit Devices.
 - 2. A156.26-06 - Continuous Hinges.
 - 3. A156.32-14 - Integrated Door Opening Assemblies.
- C. ASTM International (ASTM):
 - 1. A1011/A1011M-14 - Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
 - 2. E2180-07(2012) - Determining the Activity of Incorporated Antimicrobial Agents in Polymeric or Hydrophobic Materials.
- D. Door and Hardware Institute (DHI):

1. Recommended Locations for Architectural Hardware for Standard Doors & Frames (2004).
 2. Recommended Locations for Builders' Hardware Custom Steel Doors & Frames (1996).
- E. National Fire Protection Association (NFPA):
1. 105-16 - Smoke Door Assemblies and Other Opening Protectives.
 2. 252-12 - Fire Tests of Door Assemblies.
- F. Steel Door Institute (SDI):
1. A250.3-11 - Test Procedure and Acceptance Criteria for Factory Applied Finish Coatings for Steel Doors and Frames.
 2. A250.8-14 - Specifications for Standard Steel Doors and Frames.
 3. A250.10-11 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
- G. UL LLC (UL):
1. 10C-09 - Positive Pressure Fire Tests of Door Assemblies.
 2. 1784-15 - Air Leakage Tests of Door Assemblies and Other Opening Protectives.

1.4 PREINSTALLATION MEETINGS

- A. Conduct preinstallation meeting minimum 30 days before beginning Work of this section.
1. Required Participants:
 - a. Contracting Officer's Representative.
 - b. Architect/Engineer.
 - c. Contractor.
 - d. Installer.
 - e. Other installers responsible for adjacent and intersecting work, including electrical.
 2. Meeting Agenda: Distribute agenda to participants minimum 3 days before meeting.

- a. Installation schedule.
 - b. Installation sequence.
 - c. Preparatory work.
 - d. Protection before, during, and after installation.
 - e. Installation.
 - f. Transitions and connections to other work.
 - g. Other items affecting successful completion.
3. Document and distribute meeting minutes to participants to record decisions affecting installation.

1.5 SUBMITTALS

- A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Submittal Drawings:
 1. Show size, configuration, and fabrication and installation details.
 2. For each opening, list finish hardware items included in assembly, finish, degree of opening, and electrical rough-in requirements according to Door Schedule.
 3. Submit templates to door and frame manufacturers to ensure proper size and location of hardware.
- C. Manufacturer's Literature and Data:
 1. Description of each product.
 2. Installation instructions.
- D. Sustainable Construction Submittals:
 1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.
 2. Low Pollutant-Emitting Materials:
 - a. Show volatile organic compound types and quantities.
- E. Certificates: Indicate integrated door assemblies comply with specifications.
 1. Show fire rated integrated door assembly is UL Listed for specified application.

- F. Qualifications: Substantiate qualifications comply with specifications.
 - 1. Installer.
- G. Operation and Maintenance Data:
 - 1. Care instructions for each exposed finish product.
 - 2. Maintenance and adjustment instructions for integrated door assemblies.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Regularly installs specified products.
 - 2. Installed specified products with satisfactory service on five similar installations for minimum five years.
 - a. Provide contact names and addresses for completed projects when requested by Contracting Officer's Representative.

1.7 DELIVERY

- A. Deliver products in manufacturer's original sealed packaging.
- B. Mark packaging, legibly. Indicate manufacturer's name.
- C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.8 STORAGE AND HANDLING

- A. Store products indoors in dry, weathertight facility.
- B. Protect products from damage during handling and construction operations.

1.9 FIELD CONDITIONS

- A. Field Measurements: Verify field conditions affecting integrated door assembly fabrication and installation. Show field measurements on Submittal Drawings.
 - 1. Coordinate field measurement and fabrication schedule to avoid delay.
 - 2. Coordinate electrical work for electrified hardware installation.

1.10 WARRANTY

- A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

- B. Manufacturer's Warranty: Warrant door closers and hinges against material and manufacturing defects.
 - 1. Warranty Periods:
 - a. Door Closers: 10 years.
 - b. Steel Pinned Continuous Hinges: 10 years.

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

- A. Design integrated door assemblies complying with specified performance:
 - 1. BHMA A156.32: Grade 1: 1,000,000 cycles.
- B. Fire Rated Doors:
 - 1. Fire Resistance Rating: As shown in Door Schedule.
 - 2. Label: Comply with NFPA 252, UL 10C, and labeled by qualified testing and inspection agency showing fire resistance rating.
- C. Smoke Rated Doors:
 - 1. Smoke Resistance Rating: As shown in Door Schedule.
 - 2. Label: Comply with NFPA 105, UL 1784, and labeled by qualified testing and inspection agency showing smoke resistance rating.

2.2 PRODUCTS - GENERAL

- A. Basis of Design: Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Provide each integrated door assembly from one manufacturer.
- C. Sustainable Construction Requirements:
 - 1. Steel Recycled Content: 30 percent total recycled content, minimum.
 - 2. Low Pollutant-Emitting Materials: Comply with VOC limits specified in Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS for the following products:
 - a. Non-flooring adhesives and sealants.
 - b. Paints and coatings.

2.3 INTEGRATED DOOR ASSEMBLY

- A. Metal Doors: SDI A250.8; Level 2 and Physical Performance Level B, heavy duty; Model 2 seamless.
 - 1. Face: ASTM A1011/A1011M; cold rolled steel, 1.0 mm (0.04 inches) thick, minimum.
 - a. Cladding: Plastic laminate.
 - 2. Core: Kraft paper honeycomb or polystyrene.
 - 3. Thickness: 44 mm (1-3/4 inch).
 - 4. Reinforce door for hardware installation.
- B. Metal Frames: SDI A250.8 Level 2.
 - 1. Metal: ASTM A1011/A1011M; cold rolled steel, 1.3 mm (0.05 inches) thick, minimum.
 - 2. Construction: Continuously welded.
 - 3. Reinforce frame for hardware.
 - a. Continuous Hinges: 2.3 mm (0.09 inches) thick.
 - b. Other Hardware: Comply with SDI A250.8.
 - 4. Frame Anchors: Provide adjustable type anchors coordinated with wall construction, minimum 4 per jamb.
- C. Integrated Hardware:
 - 1. Exit Device: BHMA A156.3; Grade 1, passage function, inset in door face, clean and unobtrusive in design.
 - a. Push Bar End Caps: Metal, plated satin nickel (BHMA 619) finish.
 - b. Exit Device Trim: Lever matching door hardware specified in Section 08 71 00, DOOR HARDWARE.
 - 2. Continuous Hinges: BHMA A156.26.
 - a. Plastic Laminate Clad Doors: Wrap-around style hinge guards and provide stainless steel wrap-around edge guards at strike edge of door.
 - 3. Other Hardware: As scheduled in this section.

2.4 FINISHES

A. Hardware Finish Symbols:

Table 1 Hardware Finish Symbols

US	BHMA 156.18	Description
USP	600	Primed for field painting
US15	619	Dull Nickel Plated
US26D	626/652	Satin Chrome Plated
US28	628	Satin Aluminum
US32	629	Bright Stainless
US32D	630	Satin Stainless
N/A	689	Aluminum Painted

B. Finish Requirements:

1. Door Faces: Plastic Laminate
2. Frames: Factory Pre-Finished, SDI A250.3 .
3. Door Hardware:
 - a. Continuous Hinges: BHMA 630.
 - b. Push Bar: BHMA 630 clad with BHMA 619 end caps.
 - c. Exit Device Trim: BHMA 630.
 - d. Push/Pull Trim: BHMA 626.
 - e. Door Closers: BHMA 689.
 - f. Miscellaneous: To match other finishes.
4. Anti-Microbial Coating: ASTM E2180; ionic silver coating.
5. Apply coating to hand-operated hardware including levers, pulls, push bars, push plates, and paddles.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine and verify substrate suitability for product installation.

- B. Protect existing construction and completed work from damage.

3.2 INSTALLATION - INTEGRATED DOOR ASSEMBLIES

- A. Install products according to manufacturer's instructions and approved submittal drawings.
- B. Install door hardware at locations indicated in DHI Recommended Locations for Architectural Hardware for Standard Steel Doors & Frames and DHI Recommended Locations for Builders' Hardware Custom Steel Doors & Frames, unless otherwise indicated, or to comply with requirements of governing regulations, or if otherwise directed by Contracting Officer's Representative.
- C. Install door hardware in compliance with manufacturers' instructions, and templates. Comply with specified degree of opening for doors with automatic operators and overhead door closers. Securely fasten hardware. Confirm operating parts move freely and smoothly without binding, sticking, and excessive clearance.
- D. Coordinate installation and interface wiring with fire alarm and smoke detection systems. Provide auxiliary contacts, relays, and interface for fire alarm and security systems.
- E. Remove or protect door hardware, before painting and finishing performed after integrated door assembly installation.
- F. Adjust and check door assembly and each operating hardware item to ensure correct operation and function. Replace products which cannot be adjusted to operate as intended.
- G. Final Adjustment: Perform final hardware check and adjustment maximum one month before building acceptance or partial building occupancy.

3.3 CLEANING

- A. Clean exposed surfaces, including hardware. Do not use cleaners that will harm finishes.

3.4 PROTECTION

- A. Protect integrated door assemblies from construction operations.

3.5 SCHEDULES

- A. The following is a general listing of the Integrated Door Assembly requirements and is not intended for use as a final door submittal. Provide hardware items required by established standards and practices, and to meet IBC and NFPA 101 whether specified or not in the following listed groups.

HW-6D	
Each [ADO] Integrated Door to Have:	RATED
1 Steel Frame	
1 Integrated Door w/Exit Device	Q2131 x TYPE 8 ELECTRIC DEVICE (E04) x F08 LEVER
1 Continuous Transfer Hinge	A51031B x 8-THRUWIRE TRANSFER x IN-HINGE ACCESS PANEL
1 Power Supply	BY EXIT DEVICE MFR. FOR E04 FUNCTION
1 Armor Plate	J101 x 1.275 mm (0.050 inch) THICKNESS
1 Floor Stop	L02121 x 3 FASTENERS
1 Set Self-Adhesive Seals	ROE154

Each [ADO] Integrated Door to Have:

POWER TRANSFER SHARED BY ELECTRIC PANIC AND RE-ACTIVATION SENSOR WIRING

(RE-ACTIVATION SENSORS PROVIDED BY SECTION 08 71 13).

LOCK CYLINDER BY SECTION 08 71 00, DOOR HARDWARE.

AUTO DOOR OPERATOR AND CONTROLS BY SECTION 08 71 13, AUTOMATIC DOOR OPERATORS.

HW-SH-4

Each [AC, EL, REX, DPS] Integrated Door to Have:	RATED
1 Steel Frame	
1 Integrated Door w/Elec. Exit Device	Q2131 x TYPE 8 ELECTRIC DEVICE (E01, E05/E06-VERIFY)x F13 LEVER
1 Continuous Transfer Hinge	A51031B x 4-THRUWIRE TRANSFER x IN-HINGE ACCESS PANEL
1 Power Supply	REGULATED, FILTERED, 24VDC, AMPERAGE AS REQUIRED
1 Closer	C02021 (PT4D, PT4F, PT4H)
1 Armor Plate	J101 x 1.275 mm (0.050 inch) THICKNESS
1 Floor Stop	L02121 x 3 FASTENERS
1 Set Self-Adhesive Seals	R0E154
1 Alarm Contact	

120VAC POWER, CONDUIT, AND WIRING BY DIVISION 26.

CARD READER BY DIVISION 28.

LOCK CYLINDER BY SECTION 08 71 00, DOOR HARDWARE.

HW-SH-4A	
Each [ADO, AC, ELR, REX, DPS] Integrated Door to Have:	RATED
1 Steel Frame	
1 Integrated Door w/Elec Exit Device	Q2131 x TYPE 8 ELECTRIC DEVICE (E01, E04)x F13 LEVER
1 Continuous Transfer Hinge	A51031B x 12-THRUWIRE TRANSFER x IN-HINGE ACCESS PANEL
1 Power Supply	BY EXIT DEVICE MFR. FOR E04 FUNCTION
1 Armor Plate	J101 x 1.275 mm (0.050 inch) THICKNESS

1	Floor Stop	L02121 x 3 FASTENERS
1	Set Self-Adhesive Seals	R0E154
1	Alarm Contact	

120VAC POWER, CONDUIT, AND WIRING BY DIVISION 26.

AUTO DOOR OPERATOR AND CONTROLS BY SECTION 08 71 13, AUTOMATIC DOOR OPERATORS.

CARD READER BY DIVISION 28.

POWER TRANSFER SHARED BY ELECTRIC PANIC AND RE-ACTIVATION SENSOR WIRING

(RE-ACTIVATION SENSORS PROVIDED BY SECTION 08 71 13).

LOCK CYLINDER BY SECTION 08 71 00, DOOR HARDWARE.

-- E N D --

SECTION 08 31 13
ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Access doors and panels installed in walls and ceilings.

1.2 RELATED REQUIREMENTS

- A. Wire Mesh and Screen Access Doors: Section 05 50 00, METAL FABRICATIONS.
- B. Lock Cylinders: Section 08 71 00, DOOR HARDWARE.
- C. Field Painting: Section 09 91 00, PAINTING.
- D. Finish Color: Section 09 06 00, SCHEDULE FOR FINISHES.
- E. Access Doors for Control or Drain Valves: Section 21 10 00, WATER-BASED FIRE-SUPPRESSION SYSTEMS.
- F. Access Doors for Plumbing Valves: Section 21 40 00, PLUMBING FIXTURES.
- G. Locations of Access Doors for Ductwork Cleanouts: Section 23 31 00, HVAC DUCTS AND CASINGS.

1.3 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. American Welding Society (AWS):
 - 1. D1.3/D1.3M-08 - Structural Welding Code - Sheet Steel.
- C. ASTM International (ASTM):
 - 1. A653/A653M-15 - Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Sip Process.
 - 2. A1008/A1008M-15 - Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Baked Hardenable.
 - 3. A666-15 - Annealed or Cold-Worked Austenitic Stainless Steel sheet, Strip, Plate, and Flat Bar.

- 4. E119-15 - Fire Test of Building Construction and Materials.
- D. National Fire Protection Association (NFPA):
 - 1. 80-16 - Fire Doors and Other Opening Protectives.
 - 2. 251-12 - Fire Tests of Door Assemblies.
- E. National Association of Architectural Metal Manufacturers (NAAMM):
 - 1. AMP 500-06 - Metal Finishes Manual.
- F. UL LLC (UL):
 - 1. Listed - Online Certifications Directory.
 - 2. 10B-08 - Standard for Fire Tests of Door Assemblies.
 - 3. 263-11 - Fire Tests of Building Construction and Materials.

1.4 SUBMITTALS

- A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Submittal Drawings:
 - 1. Show size, configuration, and fabrication and installation details.
- C. Manufacturer's Literature and Data:
 - 1. Description of each product.
 - 2. Installation instructions.
- D. Sustainable Construction Submittals:
 - 1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.

1.5 DELIVERY

- A. Deliver products in manufacturer's original sealed packaging.
- B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, color, production run number, and manufacture date.
- C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.6 STORAGE AND HANDLING

- A. Store products indoors in dry, weathertight facility.
- B. Protect products from damage during handling and construction operations.

1.7 FIELD CONDITIONS

- A. Field Measurements: Verify field conditions affecting access door fabrication and installation. Show field measurements on Submittal Drawings.
 - 1. Coordinate field measurement and fabrication schedule to avoid delay.

1.8 WARRANTY

- A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Steel Sheet: ASTM A1008/A1008M.
- B. Galvanized Steel: ASTM A 653/A 653M.
- C. Stainless Steel: ASTM A666; Type 302 or Type 304.

2.2 PRODUCTS - GENERAL

- A. Basis of Design: Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Provide each product from one manufacturer.
- C. Sustainable Construction Requirements:
 - 1. Steel Access Doors Recycled Content: 30 percent total recycled content, minimum.
 - 2. Stainless Steel Access Doors Recycled Content: 70 percent total recycled content, minimum.

2.3 ACCESS DOORS, FIRE-RATED

- A. Door Construction:
 - 1. Ceiling Access Door Construction: ASTM E119 or UL 263.
 - 2. Wall Access Doors: NFPA 252 or UL 10B.

- B. Label: Class B opening according to UL 10B or test by another nationally recognized laboratory. 1 hour fire-rated with maximum temperature rise of 120 degrees C (216 degrees F).
- C. Door Panel: Minimum 0.0359 inch thick steel sheet, with mineral-fiber insulation core, insulated sandwich type construction.
- D. Frame: Minimum 0.0598 inch thick steel sheet, depth and configuration to suit material and construction type where installed.
 - 1. Frame Flange: Provide at units installed in concrete, masonry, or gypsum board.
 - 2. Exposed Joints in Flange: Weld and grind smooth.
 - 3. Provide expanded galvanized metal lath perimeter wings when installed in plaster, except veneer plaster.
- E. Provide automatic closing device.
- F. Hinge: Continuous steel hinge with stainless steel pin.
- G. Lock: Self-latching, mortise type with provision for fitting flush a standard screw-in type lock cylinder.
 - 1. Lock cylinder specified in Section 08 71 00, DOOR HARDWARE.
 - 2. Latch release device operable from inside of door.
- H. Anchors for Fire-Rated Access Doors: Comply with requirements of applicable fire test.

2.4 ACCESS DOORS, FLUSH PANEL, NON-RATED

- A. Door Panel:
 - 1. 0.07 inch thick steel.
 - 2. Reinforce to maintain flat surface.
- B. Frame:
 - 1. 0.06 inch thick steel sheet, depth and configuration to suit material and construction type where installed.
 - 2. Frame Flange: Provide at units installed in concrete, masonry, and gypsum board.
 - 3. Exposed Joints in Flange: Weld and grind smooth.

4. Provide expanded galvanized metal lath perimeter wings when installed in plaster, except veneer plaster.
- C. Hinge:
 1. Concealed spring hinge, 175 degrees of opening.
 2. Removable hinge pin to allow removal of door panel from frame.
- D. Lock:
 1. Flush, screwdriver-operated cam lock.

2.5 ACCESS DOOR, RECESSED PANEL, NON-RATED

- A. Door Panel:
 1. 0.05 inch thick steel sheet to form a 1 inch deep recessed pan to accommodate installation of acoustical units and other materials where shown in walls and ceiling.
 2. Reinforce to prevent sagging.
- B. Frame:
 1. 0.06 inch thick steel sheet of depth and configuration to suit installation in suspension system of ceiling or wall framing.
 2. Extend sides of frame to protect edge of acoustical units when door panel is in open position.
 3. Provide shims, bushings, clips and other devices necessary for installation.
- C. Hinge: Continuous steel hinge with stainless steel pin, or concealed hinge.
- D. Lock:
 1. Flush screwdriver-operated cam lock.
 2. Plastic sleeve or stainless steel grommet to protect hole made in acoustical unit for screwdriver access to lock.

2.6 FABRICATION - GENERAL

- A. Size: Minimum 24 inches square door unless otherwise shown or required to suit opening in suspension system of ceiling.
- B. Component Fabrication: Straight, square, flat and in same plane where required.
 1. Exposed Edges: Slightly rounded, without burrs, snags and sharp edges.

2. Exposed Welds: Continuous, ground smooth.
3. Welding: AWS D1.3/D1.3M.
- C. Locks and Non-Continuous Hinges: Provide in numbers required to maintain alignment of door panel with frame. For fire-rated doors, provide hinges and locks as required by fire test.
- D. Anchoring: Make provisions in frame for anchoring to adjacent construction. Provide anchors in size, number and location on four sides to secure access door to substrate. Provide anchors as required by fire test.

2.7 FINISHES

- A. Steel Paint Finish:
 1. Powder-Coat Finish: Manufacturer's standard two-coat finish system consisting of the following:
 - a. One coat primer.
 - b. One coat thermosetting topcoat.
 - c. Dry-film Thickness: 2 mils minimum.
 - d. Color: Refer to Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Stainless Steel Exposed Surfaces: NAAMM AMP 500; No. 4 polished finish.

2.8 ACCESSORIES

- A. Fasteners: Type and size recommended by access door manufacturer, to suit application.
 1. Stainless Steel Access Doors: Stainless steel fasteners.
 2. Other Access Doors: Galvanized steel fasteners.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine and verify substrate suitability for product installation.
 1. Verify access door locations and sizes provide required maintenance access to installed building services components.

- B. Protect existing construction and completed work from damage.

3.2 INSTALLATION - GENERAL

- A. Install products according to manufacturer's instructions and approved submittal drawings.
 - 1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.
- B. Install access doors and panels permitting access to service valves, traps, dampers, cleanouts, and other mechanical, electrical and conveyor control items concealed in walls and partitions, and concealed above gypsum board and plaster ceilings.
- C. Install fire rated access door according to NFPA 80.
- D. Install fire-rated doors in fire-rated partitions and ceilings.
- E. Install flush access panels in partitions and in gypsum board and plaster ceilings.

3.3 ACCESS DOOR AND FRAME INSTALLATION

- A. Wall Installations: Install access doors in openings with sides vertical.
- B. Ceiling Installations: Install access doors parallel to ceiling suspension grid or room partitions.
- C. Frames without Flanges: Install frame flush with surrounding finish surfaces.
- D. Frames with Flanges: Overlap opening, with face uniformly spaced from finish surface.
- E. Recessed Panel Access Doors: Install with face of surrounding materials flush with door panel installed finish.
- F. Secure frames to adjacent construction with fasteners.
- G. Install type, size and quantity of anchoring device suitable for material surrounding opening to maintain alignment, and resist displacement, during normal use of access door.
- H. Field Painting Primed Access Doors: Comply with the requirements of Section 09 91 00, PAINTING.

3.4 ADJUSTMENT

- A. Adjust hardware so door panel opens freely.

- B. Adjust door when closed so door panel is centered in frame.

-- E N D --

SECTION 08 34 53
SECURITY DOORS AND FRAMES

PART I - GENERAL

1.1 DESCRIPTION

- A. The extent of forced-entry resistant (FE) and ballistic resistant (BR) door assemblies required for the Project is indicated on Contract Drawings, and in Door/Frame/Hardware schedules, including construction, profiles, swing, sizes, hardware, accessories, devices, and locations.

1.2 RELATED WORK

- A. Refer to Division 3, CONCRETE.
- B. Refer to Division 4, MASONRY.
- C. Refer to Division 5, METALS for steel supports.
- D. Doors and frames not designated for special security performances: Section 08 11 13, HOLLOW METAL DOORS AND FRAMES Section 08 14 00, INTERIOR WOOD DOORS.
- E. Windows and frames of a forced entry/ballistic resistant rated: Section 08 56 53, SECURITY WINDOWS
- F. Door Hardware: Section 08 71 00, DOOR HARDWARE.
- G. Glazing and ballistic rated glazing: Section 08 80 00, GLAZING.
- H. Package transfer boxes: Section 11 17 36, PACKAGE TRANSFER UNITS.
- I. Deal trays of a Forced Entry/Ballistic Resistant rating: Section 08 56, 59, SERVICE AND TELLER WINDOW UNITS.
- J. Guard Booths: Section 13 34 19, METAL BUILDING SYSTEMS.
- K. Card readers and biometric devices: Section 28 13 11, PHYSICAL ACCESS CONTROL SYSTEMS
- L. Intrusion alarm: Section 28 16 11, INTRUSION DETECTION SYSTEM

1.3 PERFORMANCE REQUIREMENTS

- A. General: Fabricate and install FE/BR door assemblies to achieve indicated levels of resistance. Extend resistance to include anchorages, interfaces with adjoining substrates, and hardware. Security attacks shall be unable to penetrate through

closed/locked security door assemblies in manner described; it is recognized that such attacks may damage units beyond repair and reuse, requiring replacement of work by Government:

1. Fire-rated assemblies: Where indicated for fire resistance, provide flush steel doors-and-frame units; comply with NFPA 80. Provide units that have been tested by recognized testing agency in accordance with NFPA No. 252
2. Forced-Entry (FE) resistant assemblies: Where door assembly is shown or scheduled as FE, provide door manufacturer's material and fabrication for panels, inserts, hardware, devices, and framing of units. Provide rated units where shown or scheduled:
 - a. No FE resistance rating.
 - b. Provide resistance of 5 minutes for forced entry, using basic hand tools.
 - c. Provide resistance of 15 minutes for forced entry, using basic hand tools.
3. Ballistic Resistant (BR) assemblies: Where door assembly is shown or scheduled as BR, provide door manufacturer's materials and fabrication for panel, inserts, and framing of unit. Provide rated units where shown or scheduled.

1.4 SUBMITTALS

- A. General: For each security door assembly, submit the following in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.
 1. Product data for each element of work, whether purchased from other manufacturers or provided as door Fabricator's standard production. Include data substantiating that products comply with requirements of these specifications.
 2. Manufacturer's standard color chart.
 3. Certificates: Letter from manufacturer indicating the products have been certified to meet the specified ratings.
 4. Shop drawings showing each dimensioned details of each door assembly, including performance rating, swing, hardware set, and adjacent construction. Provide drawings on B-size 11 in x 17 inch sheets. Show typical door exterior elevations at not less than $\frac{1}{4}$ inch = 1 foot (1:50) scale. After final modifications and corrections

have been incorporated into the drawings, submit drawings as AutoCAD files with DWG extension. Show the following:

- a. Unit information:
 - 1) Model Number.
 - 2) Ballistic resistant rating.
 - 3) Marks (window no.).
 - 4) Door/frame finish.
 - 5) Door type.
- b. Elevation Drawings:
 - 1) Rough opening.
 - 2) Door opening.
 - 3) Frame opening.
 - 4) Vision opening.
 - 5) Finished floor.
 - 6) Sill condition.
 - 7) Undercut for carpet.
 - 8) Weather-stripping.
 - 9) Reference numbers for primer and finish paint, including number of coats applies.
 - 10) Door class rating: rated or non-rated.
 - 11) Door and frame gauge thickness.
- c. Plan drawings:
 - 1) Relate to elevation on drawing.
 - 2) Identify "Attack" and "Protected" sides.
 - 3) Identify door swing (i.e., RH, LH, RHRB, LHRB).
 - 4) Provide key on drawings.
 - 5) Indicate room space numbers taken from Contract Drawings.
- d. Details: Show section at not less than $\frac{3}{4}$ inch = 1 ft (1:20) scale of members indicating construction, size, and thickness of components, frame profile,

location of conduit entry, threshold configuration, vision panel together with connections, fastenings, and means of separating dissimilar metals.

e. Breakdown of Product Line Items:

- 1) If Manufacturer produces one contract line item as several parts (door with transom and sidelights), they shall breakout items on drawings. Each item shall be a subdivision of that product line item number.
- 2) Installation instructions shall cite all anchorage components, including complete description of expansion anchor as well as installation criteria such as torque requirements, minimum embedment, and minimum edge distance, and shall include alert to installers to avoid cutting of rebar during concrete anchor installation.

1.5 QUALITY ASSURANCE

- A. Testing Laboratory Qualifications: For compliance with non-security performance requirements (such as fire ratings, resistance to deterioration from moisture, accessibility to persons with disabilities, or sound attenuation) on security door assemblies of this Section, use only those testing laboratories which have successfully demonstrated to Project Manager that they have experience and capabilities needed to satisfactorily conduct required tests.
- B. Provide products that have been certified by Bureau of Diplomatic Security (DS) in accordance with DS/PSD SD-STD-01.01.

1.6 IDENTIFICATION SYSTEMS

- A. Identify each assembly to provide VA with ready reference to original manufacturer to facilitate reorders, replacement parts, service, resolution of complaints, and inventory. The label shall be typically embossed/printed metal plate or metallic foil with adhesive backing for permanent identification. Locate label so that it is readily visible and convenient for identification by Project Manager after installation of assembly. The label shall be approximately 1½ inch x 3 inch (40 x 75 mm) and shall cite:
 1. Manufacturer's name/city/state.
 2. Contract number.

3. Month/Year of manufacture.
4. Mark number and Ballistic resistant rating.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver each assembly project site with fabrication, finishing, and assembly of primary panels, inserts, and frames completed and prepared for installation and connection with security systems. Disassemble hardware for shipping only to extent hardware interferes with shipping.
- B. Refer to Division One for shipping requirements.
- C. Provide removable spreader bar between jambs during fabrication, delivery, and installation and to include mullions of each frame assembly, except where integral threshold is required and serves same purpose. Do not mar finishes of assembly with installation or removal of spreader bars.
- D. Provide protection of pre-finished units, such as pre-finished with baked enamel or stainless steel, using self-adhesive paper.

1.8 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society for Testing and Materials (ASTM):
 - A153/A153M-09.....Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
 - A240/A240M-14.....Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels and General Applications
 - A653/A653M-11.....Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
 - A1008/A1008M-12.....Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-

Alloy with Improved Formability, Solution Hardened, and
Bake Hardenable

A1011/A1011M-14.....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

D1044-13.....Standard Test Method for Resistance of Transparent
Plastics to Surface Abrasion.

B. American National Standards Institute (ANSI):

ANSI A156.115 (2014) Hardware Preparation in Steel Doors and Steel Frames

ANSI A156.115W (2006) Hardware Preparation in Wood Doors with Wood or Steel
Frames

ANSI/SDI A250.8 (2014) Specifications for Standard Steel Doors and Frames

ANSI/SDI A250.11 (2012) Recommended Erection Instructions for Steel Frames.

D. American Welding Society (AWS):

D1.1/D1.1M (2010)Structural Welding Code - Steel

E. National Fire Protection Association (NFPA):

NFPA 80 2013.....Standard for Fire Doors and Other Opening Protectives

NFPA 252 (2013)Standard Methods of Fire Tests of Door Assemblies

F. Society for Protective Coatings (SSPC):

SSPC-SP 2 - 2004..... Hand Tool Cleaning

SSPC-SP 3 - 2004..... Power Tool Cleaning

G. Underwriters Laboratories, Inc. (UL):

UL 752-2005.....Bullet Resisting Equipment

H. United States Department of State Bureau of Diplomatic Security (DS):

SD-STD-01.01-1993(R2004)..... Certification Standard for Forced Entry and Ballistic
Resistance of Structural Systems

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Certified units: provide units, including frames and sub-frames which are produced by manufacturer who has previously produced, within last 10 years, units of similar security attack resistance of equivalent size and resistance ratings.

2.2 MATERIALS, GENERAL

- A. Hot-Rolled Steel Sheets and Strips: ASTM A1011, commercial quality, pickled and oiled, except as otherwise indicated.
- B. Cold-Rolled Steel Sheets: ASTM A1008, commercial quality, except as otherwise indicated.
- C. Galvanized Steel Sheets: ASTM A653 with G90 zinc coating, mill phosphatized; commercial quality, except as otherwise indicated.
- D. Stainless Steel Sheets: AISI Type 302/304, complying with ASTM A240; commercial quality, No. 4 directional polish.
- E. Supports and Anchors: Fabricate to endure required performances, but of not less than 1/16 inch (1.5 mm) sheet steel. For exterior wall assemblies, hot-dip zinc coat support/anchor units after fabrication in compliance with ASTM A 153, Class B.
- F. Inserts, Bolts, Fasteners: Standard units of strengths required to endure performances; hot-dip zinc coated where used in exterior wall assemblies in compliance with ASTM A 153, Class C/D.
- G. Vision Lights General: Fabricate vision lights of sizes shown and scheduled with same performance capabilities as specified/shown for door assembly where installed. Where applicable, achieve performances and combined performances through lamination of transparent sheets, films, and screens of standard manufactured/tested products. Comply with applicable provisions of Division 8, Section 08 80 00, GLAZING.
 - 1. Forced-Entry (FE) Resistance: Where assembly is indicated for forced-entry resistance rating (FE), provide light of size shown or scheduled in accordance with certification.

2. Ballistic Resistance (BR): Where assembly is indicated for ballistic-resistance rating (BR), provide light of size shown or scheduled in accordance with certification.
3. Vision light faces general: Except as otherwise shown, where forced-entry or ballistic resistance is required, provide face of light exposed on exterior (to the "attack") as glass surface, and where unit is of laminated construction, provide face exposed on interior ("safe") as polycarbonate surface. Provide exposed polycarbonate surfaces to include an abrasion-resistant coating for 3 percent maximum haze increase for 100 revolutions on 500g Taber abraser, ASTM D1044.

2.3 HARDWARE

- A. General: Provide special units of door hardware to achieve performances, and as shown and scheduled. Standard units for each security door assembly are specified to be furnished as work of Section 08 71 00, DOOR HARDWARE; see Project "Finish Hardware Schedule" and "Data Sheets," and provisions of this Section, as well as notes on door-and-frame schedule.

2.4 FABRICATION AND ASSEMBLY

- A. General: Fabricate, test, and preassemble security door assemblies with hardware at factory; disassemble hardware only to extent necessary for handling, packaging, shipment, and installation at Project. Fabricate metal work to comply with performance requirements. Fabrications shall be rigid, neat, and free from warp/buckle/similar defects, with eased edges and continuously-welded joints, ground where exposed, to produce smooth, flush, invisible joints. Weld in accordance with AWS D1.1, Structural Welding Code for Steel:
 1. Prepare panels and frames of each assembly to receive hardware, devices, and accessory units as shown and scheduled. Reinforce work for hardware and devices, and cut work for mortised or concealed units; comply with ANSI A156.115, working from templates supplied by unit manufacturers and suppliers:
 - a. Locate hardware, devices, and accessories as required by Section Section 08 11 13, HOLLOW METAL DOORS AND FRAMES Section 08 14 00, INTERIOR WOOD DOORS Section 08 71 00, DOOR HARDWARE.

- b. Locate hardware, devices, and accessories as shown and scheduled (including on approved shop drawings) or, if not otherwise indicated: 1) in accordance with ANSI A156.115 and A156.115W Recommended Locations for Builder's Hardware or, 2) in accordance with security device manufacturer's recommendation for optimum responses, but 3) in any case, as required to achieve required assembly performances.
 - c. Except where assembly is equipped with door-seal stripping at jambs and head, provide neoprene door silencers on stops; three at strike jamb for single door, and four at head for double door.
 - d. Except as otherwise indicated, pre-fabricate and preassemble security door assemblies to include full extent of required conduit-protected electrical/electronic power-and-control wiring placed and supported to avoid conflicts with other elements and subsequent drilling/cutting-in of work during installation of units. Provide access ports as required to support 1 inch conduit.
 - e. Clearances: Not more than 1/8 inch at jambs and heads, except not more than 1/4 inch between fire-rated pair of doors. Nor more than 1/4 inch at bottom. Undercut for carpets are not permitted where doors are used in corridors. Fabricate frames with horizontally slotted bolt holes.
- 2. Provide removable glazing stops and similar moldings on interior or "safe" side of assemblies. Glazing shall be removable without removing door from frame.
 - 3. Shop Painting: Provide base-coat, factory-applied painting of ferrous metal elements of assemblies excluding other specified exposed-finish surfaces of stainless steel, aluminum, bronze, and similar metals not intended for painting.
 - a. Clean steel and zinc-coated steel surfaces of mill scale, rust, oil, grease, dirt and other substances, immediately before finish application.
 - b. Apply pretreatment of cold phosphate solution (SSPC-SP 2) or basic zinc chromate/vinyl-butyl solution (SSPC-SP 3).

- c. Apply paint coat specified for shop application, and bake on within time limits recommended by manufacturer of pretreatment. Apply in a uniform, smooth coat to result in dry film thickness of not less than 0.002 inch (0.05 mm).
- 4. Vision panels:
 - a. The transparencies shall be enclosed and cushioned within core of door for continuous perimeter bite of not less than $\frac{3}{4}$ inch on each side and $\frac{1}{4}$ inch cushion clearance to fixed metal stop on glazing edges. Glazing shall be installed by manufacturer with no raw metal edges evident or in contact with glass in door vision openings. Vision opening edges shall be cushioned and trimmed neatly to provide acceptable appearance.
 - b. If external frames are used to either side or to both faces of door, frame(s) shall not exceed $1\text{-}9/16$ inch in width and shall be configured internally to cushion all perimeter edges and faces of glazing and provide minimum bite of $3/4$ inch and $1/4$ inch cushion clearance to fixed metal stop on glazing edges. Frame shall not produce pinch point with hardware. All external bolts to attach frame shall be flush mounted. Alternatively, protruding bolt heads shall be covered with additional trim frame and flush mounted screws.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install security door assemblies in accordance with approved shop drawings, manufacturer's data and instructions, and requirements of these specifications. Install as required to achieve specified performances, and to comply with recommendations of related industry association or testing agency sponsoring standards for required non-security performances. Install door assemblies plumb and level:
 - 1. Install assemblies in compliance with recommendations and instructions of ANSI A250.8 and ANSI A250.11.
 - 2. At fire-rated door openings, comply with NFPA Standard No. 80.
 - 3. Properly hang and align FE/BR doors so that pull open exertion does not exceed 12 lbs (5.4 kg.).

4. Installer shall not grind any portion of door, frame or locking device strikes.
5. Locking device strikes shall engage strike plate without binding.
- B. Anchorage: The door manufacturer shall provide anchors appropriate for substrate to which door frame is to be fastened. Structural frames shall have pre-drilled bolt hole patterns not to exceed 12 inches on center. The manufacturer shall verify substrates involved, and supply any special fastening tools (e.g., special drill or bit) required by anchoring system. The anchor shall be acceptable for shock/short duration loading, and have potential for removal during life of building. The anchor shall also meet the following requirements:
 1. Anchor diameter: 3/8 inch minimum.
 2. Embedment and edge distances shall be as indicated on Contract Drawings and as appropriate for anchor and substrate, but not less than the following:
 - a. Embedment in concrete: 3 1/2 inches.
 - b. Embedment in solid masonry: 6 inches.
 - c. Edge distance: 3 inches
 3. The minimum anchor strengths shall be:
 - a. Yield Strength: 135,000 psi (900 MPa)
 - b. Tensile Strength: 186,000 psi (1240 MPa)
 4. Avoid cutting of rebar during concrete anchor installation. Shims provided for rough opening (RO) frame clearance should not exceed 1/4 inch. Cap plugs used in frame shall match frame finish.

3.2 ADJUST AND CLEAN

- A. General: Upon request of Project Manager, remove protective coverings and clean exposed surfaces. Repair damaged elements, restore abraded surfaces, touch-up base-coat paint finish with air-drying primer, and remove imperfections from exposed natural metal finishes.
- B. Check and readjust hardware, devices, and accessories with door-to-frame-and-sill/threshold clearances set for proper operation of locks, door seals, and other operational units. Do not remove permanently applied performance labels.

- C. Comply with "Door Hardware" section requirements for protection and handling of keys and locking devices, and associated information.
- D. Exercise extreme care in the cleaning of exposed surfaces of polycarbonate; comply with manufacturer's directions.

--- E N D ---

SECTION 08 34 59
VAULT DOORS AND DAY GATES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Factory finished vault door complete with frame, combination lock, hardware, threshold, and day gate installed in within Pharmacy.

1.2 RELATED REQUIREMENTS

- A. Day gate lock cylinder: Section 08 71 00, DOOR HARDWARE.
- B. Intrusion alarm: Section 28 16 11, INTRUSION DETECTION SYSTEM.

1.3 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. Federal Qualified Products List (QPL):
 - 1. AA-D-600-8 - Door, Vault, Security.
 - 2. FF-2470-8 - Locks, Combination.
- C. Federal Specifications (Fed. Spec.):
 - 1. AA-D-600D(2) - Door, Vault, Security.
 - 2. FF-L-2740A(1) - Locks, Combination.

1.4 SUBMITTALS

- A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Submittal Drawings: Show size, configuration, and configuration and installation details.
 - 1. Vault door.
 - 2. Day gate.
- C. Manufacturer's Literature and Data:
 - 1. Description of each product.
 - 2. Installation instructions.
- D. Sustainable Construction Submittals:

1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.
- E. Key change and combination changing instructions with copy of signed receipt.

1.5 DELIVERY

- A. Deliver products in manufacturer's original sealed packaging.
- B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, color, production run number, and manufacture date.
- C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.6 WARRANTY

- A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 PRODUCTS - GENERAL

- A. Provide each product from one manufacturer.
- B. Sustainable Construction Requirements:
 1. Steel Components Recycled Content: 30 percent total recycled content, minimum.

2.2 VAULT DOOR

- A. Fed. Spec. AA-D-600, Class 5-V, Type IIR (right open swing) without optical device, Style K, (Key change combination lock).
 1. Approved Products: QPL AA-D-600 listed.
- B. Door Stop: Wall type to suit application .

2.3 COMBINATION LOCK

- A. Fed. Spec. FF-L-2740, Style 1 self-contained with key change combination.
 1. Approved Products: QPL FF-L-2740 listed.

2.4 DAY GATE

- A. Self-closing metal construction with expanded mesh or solid bars infill, minimum 0.12 inch steel.

1. Finish: Match vault door and frame.
- B. Hardware: Heavy duty hinges.
- C. Locking: Automatic, key controlled from vault exterior, and thumb-turn latch release accessible from vault interior, only.
 1. Keying: Match Pharmacy door hardware cylinder keying.

2.5 FINISHES

- A. Steel Paint Finish:
 1. Powder-Coat Finish: Manufacturer's standard two-coat finish system consisting of the following:
 - a. One coat primer.
 - b. One coat thermosetting topcoat.
 - c. Dry-film Thickness: 2 mils minimum.
 - d. Color: Refer to Section 09 06 00, SCHEDULE FOR FINISHES.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine and verify substrate suitability for product installation.
 1. Verify rough opening is properly sized and located.
 2. Verify wall construction will support vault and day gate door weight.
 3. Verify factory-applied lock seal is unbroken.
- B. Remove key change and combination changing instructions from packaging and deliver to Contracting Officer's Representative, in manufacturer's original, unopened packaging.
 1. Obtain signed receipt.
- C. Protect existing construction and completed work from damage.

3.2 INSTALLATION - GENERAL

- A. Install products according to manufacturer's instructions and approved submittal drawings.
 1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.

- B. Hang vault door and day gate plumb and level.
- C. Securely attach vault door and day gate to wall construction.
- D. Engage locksmith to reset lock combination in presence of Contracting Officer's Representative.
- E. Adjust vault door and day gate for smooth operation and proper locking.
 - 1. Ensure vault door and day gate remain stationary when set anywhere within full swing path.

3.3 CLEANING

- A. Clean exposed vault door and day gate surfaces. Remove contaminants and stains.

3.4 PROTECTION

- A. Protect vault door and day gate from construction operations.
- B. Remove protective materials immediately before acceptance.
- C. Repair damage.

-- E N D --

SECTION 08 41 13
ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Aluminum-framed entrances and storefronts.
 - 2. Interior ICU sliding doors.

1.2 RELATED REQUIREMENTS

- A. Door Finish and Color: Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Glass and Glazing: Section 08 80 00, GLAZING.
- C. Hardware: Section 08 71 00, DOOR HARDWARE.
- D. Automatic Door Actuators: Section 08 71 13, AUTOMATIC DOOR OPERATORS.
- E. Aluminum Finish and Color: Section 09 06 00, SCHEDULE FOR FINISHES.
- F. Blast Resistance: Section 08 56 53 BLAST RESISTANT WINDOWS

1.3 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. American Architectural Manufacturers Associations (AAMA):
 - 1. 2603-15 - Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.
 - 2. 2604-13 - Performance Requirements and Test Procedures for High Performance Organic Coatings on Architectural Extrusions and Panels.
 - 3. 2605-13 - Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.
- C. American Welding Society (AWS):
 - 1. D1.2/D1.2M-14 - Structural Welding Code - Aluminum.
- D. ASTM International (ASTM):
 - 1. A240/A240M-15b - Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
 - 2. B209-14 - Aluminum and Aluminum-Alloy Sheet and Plate.

3. B209M-14 - Aluminum and Aluminum-Alloy Sheet and Plate (Metric).
4. B221-14 - Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
5. B221M 13 - Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).
6. D1187/D1187M-97(2011)e1 - Asphalt-Base Emulsions for Use as Protective Coatings for Metal.
7. E283-04(2012) - Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
8. E330/E330M-14 -Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
9. E331-00(2009) - Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
10. E1886-13a - Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missiles and Exposures to Cyclic Pressure Differentials.
11. E1996-14a - Performance of Exterior Windows, Curtain Walls, Doors, and impact Protective Systems Impacted by Windborne Debris in Hurricanes.
12. F468-15 - Nonferrous Bolts, Hex Cap Screws, and Studs for General Use.
13. F593-13a - Stainless Steel Bolts, Hex Cap Screws, and Studs.
- E. National Association of Architectural Metal Manufacturers (NAAMM):
 1. AMP 500-06 - Metal Finishes Manual.
- F. National Fenestration Rating Council (NFRC):
 1. 500-14(E1A0) - Determining Fenestration Product Condensation Resistance Values.
- G. United States Veterans Administration (VA):
 1. PSDSDD - Physical Security Design Standards Data Definitions.

1.4 PREINSTALLATION MEETINGS

- A. Conduct preinstallation meeting minimum 30 days before beginning Work of this section.

1. Required Participants:
 - a. Contracting Officer's Representative.
 - b. Architect/Engineer.
 - c. Contractor.
 - d. Installer.
 - e. Other installers responsible for adjacent and intersecting work, including
2. Meeting Agenda: Distribute agenda to participants minimum 3 days before meeting.
 - a. Installation schedule.
 - b. Installation sequence.
 - c. Preparatory work.
 - d. Protection before, during, and after installation.
 - e. Installation.
 - f. Terminations.
 - g. Transitions and connections to other work.
 - h. Other items affecting successful completion.
3. Document and distribute meeting minutes to participants to record decisions affecting installation.

1.5 SUBMITTALS

- A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Submittal Drawings: Minimum 1 to 2 (half size) scale.
 1. Show size, configuration, and fabrication and installation details.
 2. Show anchorage and reinforcement.
 3. Show interface and relationship to adjacent work, including thermal, air, and water barrier continuity.
- C. Manufacturer's Literature and Data:
 1. Description of each product.
 2. Doors, each type.

3. Entrance and Storefront construction.
 4. Installation instructions.
 5. Warranty.
- D. Samples:
1. Door Corner Section: Minimum 18 x 18 inches for each specified door type, showing head rail and hinge stile, door closer reinforcement, internal reinforcement and insulation in flush panel door.
 2. Aluminum Anodized Finish: wo sample extrusions minimum 6 inches long for each specified color in sets of three showing maximum color range.
 3. Aluminum Paint Finish: wo sample extrusions minimum 6 inches long for each specified color.
- E. Sustainable Construction Submittals:
1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.
- F. Test reports: Certify products comply with specifications.
- G. Certificates: Certify products comply with specifications.
1. Certify anodized finish thickness.
- H. Qualifications: Substantiate qualifications comply with specifications.
1. Manufacturer
 2. Installer
 3. Welders and welding procedures.
- I. Delegated Design Drawings and Calculations: Signed and sealed by responsible design professional.
1. Show location and magnitude of loads applied to building structural frame.
 2. Identify deviations from details shown on drawings.
- J. Operation and Maintenance Data:
1. Care instructions for each exposed finish product.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications:

1. Regularly manufactures specified products.
 2. Manufactured specified products with satisfactory service on five similar installations for minimum five years.
- B. Installer Qualifications: Manufacturer authorized representative.
1. Regularly installs specified products.
 2. Installed specified products with satisfactory service on five similar installations for minimum five years.
- C. Welders and Welding Procedures Qualifications: AWS D1.2/D1.2M.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver products in manufacturer's original sealed packaging.
- B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, color, production run number, and manufacture date.
- C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.
- D. Store products indoors in dry, weathertight facility.
- E. Protect products from damage during handling and construction operations.

1.8 WARRANTY

- A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."
- B. Manufacturer's Warranty: Warrant painted finish against material and manufacturing defects.
 1. Warranty Period: 20 years.

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

- A. Delegated Design: Prepare submittal documents including design calculations and drawings signed and sealed by registered design professional, licensed in state where work is located.

1. Minor deviations to details shown on drawings to accommodate manufacturer's standard products may be accepted by Contracting Officer's Representative when deviations do not affect design concept and specified performance.
- B. Design aluminum framed entrances and storefronts complying with specified performance:
 1. Wind and Seismic Load Resistance: ASCE/SEI 7; Design criteria as indicated on Drawings when tested according to ASTM E330/E330M.
 - a. Wind Load: 30 psf positive and negative, minimum.
 - b. Maximum Deflection: 1/175 of span, maximum with minimum 1.65 safety factor.
 2. Thermal Movement: Accommodate ambient temperature range of 67 degrees C (120 degrees F).
 3. Blast Resistance:
 - a. Storefront System: Refer to Section 08 56 53 Blast Resistant Windows for blast loading and performance requirements.
 - b. Door Panels:
 - 1) Glazing shall consist of a minimum 1/4-inch thick inner laminated glass pane with an 0.030 inch PVB interlayer.
 - 2) Door panels shall swing outward toward the exterior and shall bear on a continuous door stop at three sides.
 - c. Door stop and frame shall be attached to supporting jamb and header elements based on the lesser of the following:
 - 1) Linear decaying blast load time-history of peak pressure, $P = 4\text{psi}$ and load duration, $t_d = 14\text{ msec.}$ applied to the door panel
 - 2) Door panel ultimate resistance based on a uniform pressure load (i.e., reaction force based on door panel plastic moment capacity)Windborne-Debris Impact Resistance: Pass ASTM E1886.
 - a. Openings within 30 feet of Grade: ASTM E1996 large missile test.
 - b. Other Openings: ASTM 1996 small missile test.

4. Condensation Resistance: NFRC 500.
 - a. Fixed Framing: 45 CRF, minimum.
5. Water Resistance: ASTM E331; No uncontrolled penetration at 380 Pa (8 psf), minimum, pressure differential.
6. Fixed Framing Air Infiltration Resistance: ASTM E283; 0.06 cfm/sf, maximum at 300 Pa (6.24 psf), minimum, pressure differential.
7. Entrance Doors Air Infiltration Resistance: ASTM E283; maximum allowable at 75 Pa (1.57 psf), minimum, pressure differential.
 - a. Single Doors: .5 cfm/sf.
 - b. Paired Doors: 1.2 cfm/sf.

2.2 MATERIALS

- A. Aluminum:
 1. Sheet Metal: ASTM B209M (ASTM B209), minimum 0.063 inch thick.
 2. Extrusions: ASTM B221M (ASTM B221).
 - a. Framing: Minimum 0.125 inch wall thickness.
 - b. Glazing Beads, Moldings, and Trim: Minimum 0.050 inch thick.
 3. Alloy 6063 temper T5 for doors, door frames, fixed glass sidelights storefronts
 4. Alloy 6061 temper T6 for guide tracks for sliding doors and other extruded structural members.
 5. Color Anodized Aluminum: Provide aluminum alloy required to produce specified color.
- B. Stainless Steel: ASTM A240/A240M; Type 302 or Type 304.

2.3 PRODUCTS - GENERAL

- A. Basis of Design: Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Provide aluminum framed entrances and storefronts from one manufacturer
- C. Provide aluminum entrances, storefront, windows, curtain wall systems from same manufacturer.
- D. Sustainable Construction Requirements:
 1. Aluminum Recycled Content: 80 percent total recycled content, minimum.

2.4 FRAMES

- A. Framing Members: Extruded aluminum
- B. Stops: Provide integral fixed stops and glass rebates and snap-on removable stops.
- C. Provide concealed screws, bolts and other fasteners.
- D. Secure cover boxes to frames in back of lock strike cutouts.

2.5 STILE AND RAIL DOORS

- A. Stiles and Rails: Extruded aluminum
 - 1. Thickness: 1-3/4 inch.
 - 2. Stiles and Head Rails: 3-1/2 inches wide.
 - 3. Bottom Rails: 10 inches wide.
- B. Single-Acting Doors:
 - 1. Bevel: 1/8 inch at lock, hinge, and meeting stile edges.
 - 2. Clearances: 1/16 inch at hinge stiles, 1/8 inch at lock stiles and top rails, and 3/16 inch at floors and thresholds.
- C. Glass Rebates: Integral with stiles and rails.
- D. Glazing Beads: Extruded aluminum, 0.050 inch thick. Integral with stiles and rails or applied type, snap-fit secured.
- E. Stile and Rail Joints: Welded or interlocking dovetail joints between stiles and rails.
 - 1. Clamp door together through top and bottom rails with 3/8 inch primed steel tie rod extending into stiles, and having self-locking nut and washer at both ends.
 - 2. Reinforce stiles and rails to prevent door distortion when tie rods are tightened.
 - 3. Provide compensating spring-type washer under each nut for stress relief.
 - 4. Construct joints to remain rigid and tight when door is operated.
- F. Weather-stripping: Removable, woven pile type (silicone-treated) weather-stripping attached to aluminum or vinyl holder.
 - 1. Make slots for applying weather-stripping integral with doors and door frame stops.
 - 2. Apply continuous weather-stripping to heads, jambs, bottom, and meeting stiles of doors and frames so doors swing freely and close positively.

2.6 FLUSH PANEL DOORS

- A. Frames: Aluminum extrusions.
- B. Doors: 1-3/4 inches thick.
 - 1. Door Edges and Internal Reinforcing: Extruded aluminum tubes, single piece full height and width, welded joints.
 - 2. Core: Manufacturer's standard non-combustible insulation.
 - 3. Faces: Aluminum sheet metal with internal impact reinforcement, laminated to the door edges and core.

2.7 COLUMN COVERS AND TRIM

- A. Column Covers and Trim: Sheet aluminum fabrications shown from sheet aluminum of longest available lengths.
- B. Provide concealed fasteners.
- C. Provide aluminum stiffeners and supporting members shown on drawings and as required to maintain component integrity and shape.

2.8 FABRICATION

- A. Form metal parts and fit and assemble joints, except joints designed to accommodate movement. Seal joints to resist air infiltration and water penetration.
- B. Welding:
 - 1. Make welds without distorting and discoloring exposed surfaces.
 - 2. Clean and dress welds. Remove welding flux and weld spatter.
- C. Prepare and reinforce doors and frames for hardware and accessories.
 - 1. Coordinate preparation with specified hardware. See Section 08 71 00, DOOR HARDWARE.
 - 2. Fabricate reinforcement from stainless steel plates.
 - a. Hinge and pivot reinforcing: Minimum 0.179 inch thick.
 - b. Lock Face, Flush Bolts, Concealed Holders, Concealed and Surface Mounted Closers Reinforcing: Minimum 0.104 inch thick.
 - c. Other Surface Mounted Hardware Reinforcing: Minimum 0.059 inch thick.

3. Where concealed hardware is specified, provide space, cutouts, and reinforcement for installation and secure fastening.

D. Factory assemble doors.

2.9 FINISHES

A. Aluminum Anodized Finish: NAAMM AMP 500.

1. Clear Anodized Finish: AA-C22A41; Class I Architectural, 0.7 mil thick.
2. Color Anodized Finish: AA-C22A42 or AA-C22A44; Class I Architectural, 0.7 mil thick.
3. Clear Anodized Finish: AA-C22A31; Class II Architectural, 0.4 mil thick.
4. Color Anodized Finish: AA-C22A32 or AA-C22A34; Class II Architectural, 0.4 mil thick.

B. Aluminum Paint finish:

1. Baked Enamel or Powder Coat: AAMA 2603; polyester resin, minimum 1.5 mil film thickness.
2. Fluorocarbon Finish: AAMA 2604; 50 percent fluoropolymer resin, 2-coat system.
3. Fluorocarbon Finish: AAMA 2605; 70 percent fluoropolymer resin, 2-coat system.

2.10 ACCESSORIES

A. Dielectric Tape: Plastic, non-absorptive, with pressure sensitive adhesive; 7 to 10 mils thick.

B. Barrier Coating: ASTM D1187/D1187M.

C. Welding Materials: AWS D1.2/D1.2M, type to suit application.

D. Fasteners:

1. Aluminum: ASTM F468, Alloy 2024.
2. Stainless Steel: ASTM F593, Alloy Groups 1, 2 and 3.

E. Anchors: Aluminum or stainless steel; type to suit application.

F. Galvanizing Repair Paint: MPI No. 18.

G. Touch-Up Paint: Match shop finish.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine and verify substrate suitability for product installation.
 - 1. Coordinate floor closer installation recessed into concrete slabs.
 - 2. Coordinate anchor installation built into masonry and concrete.
- B. Protect existing construction and completed work from damage.
- C. Clean substrates. Remove contaminants capable of affecting subsequently installed product's performance.
- D. Apply dielectric tape or barrier coating to aluminum surfaces in contact with dissimilar metals and cementitious materials to minimum 30 mils dry film thickness.

3.2 INSTALLATION - GENERAL

- A. Install products according to manufacturer's instructions and approved submittal drawings.
 - 1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.
- B. Install aluminum framed entrances and storefronts plumb and true, in alignment and to lines shown on drawings.
- C. Anchor frames to adjoining construction at heads, jambs and sills.
- D. Provide concealed aluminum clips to connect adjoining frame sections.
- E. Install door hardware and hang doors. See Section 08 71 00, DOOR HARDWARE.
- F. Install door operators. See Section 08 71 13, AUTOMATIC DOOR OPERATORS.
- G. Adjust doors and hardware uniform clearances and proper operation.
- H. Touch up damaged factory finishes.
 - 1. Repair galvanized surfaces with galvanized repair paint.
 - 2. Repair painted surfaces with touch up primer.
- I. Tolerances:
 - 1. Variation from Plumb, Level, Warp, and Bow: Maximum 1/8 inch in 10 feet.
 - 2. Variation from Plane: Maximum 1/8 inch in 12 feet; 1/4 inch over total length.

3. Variation from Alignment: Maximum 1/16 inch in-line offset and maximum 1/8 inch corner offset.
4. Variation from Square: Maximum 1/8 inch diagonal measurement differential.

3.3 PROTECTION, CLEANING AND REPAIRING

- A. Clean exposed aluminum and glass surfaces. Remove contaminants and stains.
- B. Protect aluminum-framed entrances and storefronts from construction operations.
- C. Remove protective materials immediately before acceptance.
- D. Repair damage.

--- E N D ---

SECTION 08 51 13
ALUMINUM WINDOWS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Aluminum windows for new construction

1.2 RELATED REQUIREMENTS

- A. Sealing Joints: Section 07 92 00, JOINT SEALANTS.
- B. Window Screen: Section 08 56 66, DETENTION WINDOW SCREENS.
- C. Glazing: Section 08 80 00, GLAZING.
- D. Color of finish: Section 09 06 00, SCHEDULE FOR FINISHES.
- E. Blast Resistance: Section 08 56 53 BLAST RESISTANT WINDOWS

1.3 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. American Architectural Manufacturers Associations (AAMA):
 - 1. AAMA/WDMA/CSA 101/I.S.2/A440-11 - Windows, Doors, and Skylights.
 - 2. AAMA 505-09 - Dry Shrinkage and Composite Performance Thermal Cycle Test Procedures.
 - 3. AAMA 2605-13 - Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.
 - 4. AAMA TIR A8-08 - Structural Performance of Composite Thermal Barrier Framing System.
- C. American Society of Civil Engineers/Structural Engineering Institute (ASCE/SEI):
 - 1. 7-10 - Minimum Design Loads for Buildings and Other Structures.
- D. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE):
 - 1. 90.1-13 - Energy Standard for Buildings Except Low-Rise Residential Buildings.
- E. ASTM International (ASTM):
 - 1. B209-14 - Aluminum and Aluminum-Alloy Sheet and Plate.
 - 2. B209M-14 - Aluminum and Aluminum-Alloy Sheet and Plate (Metric).

3. B221-14 - Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
4. B221M-13 - Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).
5. E283-04(2012) - Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
6. E331-00(2009) - Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.

1.4 PREINSTALLATION MEETINGS

- A. Conduct preinstallation meeting minimum 30 days before beginning Work of this section.
 1. Required Participants:
 - a. Contracting Officer's Representative.
 - b. Architect/Engineer.
 - c. Contractor.
 - d. Installer.
 2. Meeting Agenda: Distribute agenda to participants minimum 3 days before meeting.
 - a. Installation schedule.
 - b. Installation sequence.
 - c. Preparatory work.
 - d. Protection before, during, and after installation.
 - e. Installation.
 - f. Transitions and connections to other work.
 - g. Other items affecting successful completion.
 3. Document and distribute meeting minutes to participants to record decisions affecting installation.

1.5 SUBMITTAL

- A. Submit according to Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Submittal Drawings:
 - 1. Indicate window types required for project.
 - 2. Identify window unit components by name and type of metal or material, show construction, locking systems, mechanical operators, trim, installation and anchorages.
 - 3. Include glazing details and standards for factory glazed units.
- C. Manufacturer's Literature and Data:
 - 1. Description of each product.
 - 2. Installation instructions.
 - 3. Warranty.
- D. Sustainable Construction Submittals:
 - 1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.
- E. Samples:
 - 1. Window Frame: 6 inch long samples showing finishes, specified.
- F. Test reports: Indicate each product complies with specifications.
 - 1. Windows.
 - 2. Operating hardware.
- G. Certificates: Indicate each product complies with requirements (window characteristics may be on window schedule or other drawings).

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 - 1. Regularly manufactures specified products.
 - 2. Manufactured specified products with satisfactory service on five similar installations for minimum five years.

- a. Provide contact names and addresses for completed projects when requested by Contracting Officer's Representative.
- B. Quality Certified Labels or Certificates:
 1. AAMA Label affixed to each window indicating compliance with specification.
 2. Certificates in lieu of label with copy of test report maximum 4 years old from independent testing laboratory and certificate signed by window manufacturer stating that windows provided comply with specified requirements and AAMA/WDMA/CSA 101/I.S.2/A440 for type of window specified.

1.7 STORAGE AND HANDLING

- A. Protect windows from damage during handling and construction operations before, during and after installation.
- B. Store windows under cover, setting upright.
- C. Do not stack windows flat.
- D. Do not lay building materials or equipment on windows.

1.8 WARRANTY

- A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."
- B. Manufacturer's Warranty: Warrant windows against material and manufacturing defects.
 1. Warranty Period: 10 years.

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

- A. Design windows complying with specified performance:
 1. Load Resistance: ASCE/SEI 7
 - a. Performance Grade: AAMA/WDMA/CSA 101/I.S.2/A440 required to resist maximum positive and negative wind load.
 - b. Blast Resistance: Refer to Section 08 56 53 Blast Resistant Windows for blast loading and performance requirements.

2. Thermal Transmittance: Maximum U-value W/sq. m/degree K
(Btu/sq. ft./hr./degree F).
 - a. Insulating Glass Windows: U-2.8 (U-0.5).
 - b. Dual Glazed Windows: U-4.0 (U-0.7), or as required by ASHRAE 90.1.
 3. Condensation Resistance Factor (CRF): NFRC 500 Minimum CRF of C 45
 4. Water Resistance: ASTM E331; No uncontrolled penetration at 220 Pa (4.50 psf), minimum, pressure differential.
 5. Air Infiltration Resistance: ASTM E283; 0.3 cfm/sq. ft., maximum at 75 Pa (1.57 psf), minimum, pressure differential.
- B. Provide the following operation types for locations indicated on the Drawings.
1. Hung Windows: Single hung.
 - a. Performance Class and Grade: AAMA/WDMA/CSA 101/I.S.2/A440, minimum CW-30.
 - b. Provide units with tilt-in feature permitting both sides of both sash to be cleaned from interior.
 - 1) Restrict sash tilting without use of maintenance release mechanism and removable locking handle.
 - 2) Finger operated tilt latches not acceptable.
 2. Fixed Windows:
 - a. Performance Class and Grade: AAMA/WDMA/CSA 101/I.S.2/A440, minimum CW-30.

2.2 MATERIALS

- A. Aluminum Extrusions: ASTM B221M (ASTM B221); 6063 alloy, T5 temper.
- B. Aluminum Sheet: ASTM B209M (ASTM B209); 5005 alloy, H15 or H34 temper.

2.3 PRODUCTS - GENERAL

- A. Basis of Design: Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Provide windows from one manufacturer.
- C. Sustainable Construction Requirements:

1. Aluminum Recycled Content: 80 total recycled content, minimum.

2.4 ALUMINUM WINDOWS

- A. Frames and Sashes: Aluminum extrusions, AAMA/WDMA/CSA 101/I.S.2/A440.
- B. Thermal-Break Window Construction:
 1. Manufacturer's Standard.
 2. Low conductance thermal barrier.
 3. Capable of structurally holding sash in position and together.
 4. Thermal Break Assemblies: Tested according to AAMA TIR A8 and AAMA 505.
 5. Design location of thermal break so that, in closed position, outside air does not come in direct contact with interior frame of window.
- C. Mullions: Match window units.
- D. Provide anchors and other related accessories required for installation.

2.5 GLAZING

- A. Glass and Glazing: As specified in Section 08 80 00, GLAZING.
 1. Factory glaze windows.
 2. Weep holes through glazed areas are not acceptable.

2.6 INSECT SCREENING

- A. Screen Mesh: 18 by 18, AAMA/WDMA/CSA 101/I.S.2/A440.
 1. Screen Cloth: Aluminum
- B. Frame: Aluminum, match window unit finish type and color, unless otherwise indicated.

2.7 HARDWARE

- A. Locks: Two position locking bolts or cam type tamperproof custodial locks with a single point control located not higher than 60 inches from floor level. Locate locking devices in vent side rail. Provide concealed or nonremovable fastenings for locks and keepers. Provide cam type locks on single hung and double windows to pull window sashes together in a locked and secured position.
- B. Locking Device Strikes: Locate adjustable strikes in frame jamb. Fabricate strikes from Type 304 stainless steel or white bronze.

- C. Counterbalancing: Primary window sash shall be equipped with counterbalancing mechanisms meeting the requirements of AAMA 902 or AAMA 908. Counterbalancing mechanism shall be of appropriate size and capacity to hold the sash stationary at any open position shall be used for the weights of sash to be counterbalanced.
- D. Fabricate hinges of noncorrosive metal. Hinges may be either fully concealed when window is closed or semi-concealed with exposed knuckles and hospital tips. Surface mounted hinges are not acceptable.
- E. Guide Blocks: Fabricate guide blocks of injection molded nylon. Install guide block fully concealed in vent/frame sill.
- F. Hardware for Emergency Ventilation of Windows:
 - 1. Provide windows with hold open linkage.
 - 2. Provide hold open hardware for maximum 6 inches of window opening with adjustable friction shoe to provide resistance when closing window.
 - 3. Handles: Removable type.
- G. Hardware for Maintenance Opening of Windows: Opening beyond limit stop position accomplished by maintenance key captured by release device when window is in open position.
 - 1. Design operating device to prevent opening with standard tools, coins or bent wire devices.
- H. Pole Operators:
 - 1. Provide pole operator and pole hanger where operable windows have hardware more than 60 inches above floor, but not over 10 feet above floor.
 - 2. Fabricate pole of tubular anodized aluminum with rubber cap at lower end and standard push-pull hook at top end to match hardware design.
 - 3. Provide sufficient length for window operation without reaching more than 60 inches above floor.
 - 4. Provide one operating pole and one pole hanger in each room or space where pole operation of windows is required.

- I. Weather Stripping: AAMA/WDMA/CSA 101/I.S.2/A440; leaf type weather-stripping is not acceptable.
- J. Provide wrenches, keys, or removable locking operating handles, as specified to operate windows.
 - 1. Provide one emergency ventilating operating handle for every four windows.
 - 2. Provide maintenance or window washer operating handles as required.

2.8 FABRICATION

- A. Fabricate windows to comply specified performance class and grade.
 - 1. Assemble frame and sash so fasteners are concealed when window is closed.
 - 2. Attach locking and hold-open devices to windows with concealed fasteners.
 - 3. Where extrusion wall thickness is less than 0.125 inch thick, provide backup plates or similar reinforcements for fasteners.
 - 4. Use stainless steel fasteners to secure Venetian blind hanger clips, vent guide blocks, friction adjuster, and limit opening device.
- B. Aluminum Trim:
 - 1. Trim includes casings, closures, and panning.
 - 2. Fabricate to shapes shown, minimum 0.062 inch thick.
 - 3. Extruded or formed sections, straight, true, and smooth on exposed surfaces.
 - 4. Exposed external corners mitered and internal corners coped; fitted with hairline joints.
 - 5. Reinforce 0.062 inch thick members with minimum 1/8 inch thick aluminum.
 - 6. Except for strap anchors, provide reinforcing for fastening near ends and spaced maximum 12 inches on center.
 - 7. Design to allow unrestricted expansion and contraction of members and window frames.
 - 8. Secure to window frames with machine screws or expansion rivets.
 - 9. Exposed screws, fasteners or pop rivets are not acceptable on exterior of casing or trim cover system.
- C. Aluminum Subsills and Stools:

1. Fabricate to shapes shown, minimum 0.080 inch thick extrusion.
2. One piece full length of opening with concealed anchors.
3. Sills turned up back edge minimum 1/4 inch. Front edge provide with drip.
4. Sill back edge behind face of window frame. Do not extend to interior surface or bridge thermal breaks.
5. Do not perforate for anchorage, clip screws, or other requirements.

2.9 FINISHES

- A. Finish window units according to NAAMM AMP 500 series.
- B. Anodized Aluminum:
 1. Clear Anodized Finish: AA-C22A41; Class I Architectural, 0.7 mil thick.
 2. Color Anodized Finish: AA-C22A42 or AA-C22A44; Class I Architectural, 0.7 mil thick.
- C. Aluminum Paint finish:
 1. Fluorocarbon Finish: AAMA 2605; 70 percent fluoropolymer resin, 2-coat system.
 2. Color: Refer to Section 09 06 00, SCHEDULE FOR FINISHES.
- D. Hardware: Finish hardware exposed when window is in closed position to match window.

2.10 ACCESSORIES

- A. Fasteners: AAMA/WDMA/CSA 101/I.S.2/A440; non-magnetic stainless steel.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine and verify substrate suitability for product installation.
 1. Verify openings are within acceptable tolerances.
- B. Protect existing construction and completed work from damage.

3.2 INSTALLATION, GENERAL

- A. Install products according to manufacturer's instructions and approved submittal drawings.
 1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.

- B. Where type, size or spacing of fastenings for securing window accessories or equipment to building construction is not shown or specified, provide expansion or toggle bolts or screws, as best suited to construction material.
 - 1. Provide bolts or screws minimum 1/4 inch in diameter.
 - 2. Sized and spaced to resist tensile and shear loads imposed.
 - 3. Do not install exposed fasteners on exterior, except when unavoidable for application of hardware.
 - 4. Provide non-magnetic stainless steel Phillips flat-head machine screws for exposed fasteners, where required, or special tamper-proof fasteners.
 - 5. Locate fasteners to avoid disturbing window thermal break.
- C. Set windows plumb, level, true, and in alignment; without warp or rack of frames or sash.
- D. Anchor windows on four sides with anchor clips or fin trim.
 - 1. Do not allow anchor clips to bridge thermal breaks.
 - 2. Use separate clips for both sides of thermal breaks.
 - 3. Make connections to allow for thermal and other movements.
 - 4. Do not allow building load to bear on windows.
 - 5. Use manufacturer's standard clips at corners and maximum 24 inches on center.
 - 6. Where fin trim anchorage is indicated build into adjacent construction, anchoring at corners and maximum 24 inches on center.
- E. Sills and Stools:
 - 1. Set in bed of mortar or other compound to fully support, true to line shown.
 - 2. Do not extend sill to inside window surface or past thermal break.
 - 3. Leave space for sealants at ends and to window frame unless indicated otherwise.

3.3 MULLIONS CLOSURES, TRIM, AND PANNING

- A. Cut mullion full height of opening and anchor directly to window frame on both sides.
- B. Closures, Trim, and Panning: External corners mitered and internal corners coped, fitted with hairline, tightly closed joints.

1. Secure to concrete and solid masonry with expansion bolts, expansion rivets, split shank drive bolts, or powder actuated drive pins.
 2. Toggle bolt to hollow masonry units.
 3. Screw to wood and metal.
- C. Fasten except for strap anchors, near ends and corners and maximum 12 inches on center.
- D. Seal units following installation to provide weathertight system.

3.4 ADJUSTING

- A. Adjust ventilating sash and hardware to provide tight fit at contact points, and at weather-stripping for smooth operation and weathertight closure.

3.5 FIELD TESTING

- A. Field Tests: Performed by testing laboratory specified in Section 01 45 29, TESTING LABORATORY SERVICES.
- B. Test Method: AAMA 502.
- C. Test Specimen:
1. Include window assembly and construction. Affix test chamber to interior side of test specimen and the conduct testing using positive static air pressure (Test method A).
 2. Test specimens to be selected by the Contracting Officer's Representative after windows have been installed according to the drawings and specification.

3.6 CLEANING

- A. Lubricate hardware and moving parts.
- B. Remove excess glazing and sealant compounds.
- C. Clean exposed aluminum and glass surfaces. Remove contaminants and stains.
- D. Keep windows locked except while adjusting and testing.

-- E N D --

SECTION 08 56 53
BLAST RESISTANT WINDOWS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Prefabricated fixed aluminum, blast resistant exterior window and skylight units.

1.2 RELATED REQUIREMENTS

- A. Window Color: Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Laminated glazing: Section 08 80 00, GLAZING.

1.3 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this Section.
- B. American Architectural Manufacturers Association (AAMA):
 - 1. AAMA/WDMA/CSA 101/I.S.2/A440-11 Windows, Doors, and Skylights.
- C. American Society of Civil Engineers (ASCE):
 - 1. ASCE 59-11 – Blast Protection of Buildings
- D. American Welding Society (AWS):
 - 1. D1.1/D1.1M-15 - Structural Welding Code - Steel.
 - 2. D1.3/D1.3M-08 - Structural Welding Code - Sheet Steel.
 - 3. D1.6/D1.6M-07 - Structural Welding Code - Stainless Steel.
- E. ASTM International (ASTM):
 - 1. A36/A36M-14 - Carbon Structural Steel.
 - 2. A123/A123M-15- Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - 3. A320/A320M-15a - Alloy-Steel and Stainless-Steel Bolting Materials for Low-Temperature Service.
 - 4. A666-15 - Annealed or Cold-Worked Austenitic Stainless-Steel Sheet, Strip, Plate and Flat Bar.
 - 5. B221-14 - Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

6. B221M-13 - Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
 7. E283-04(2012) - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
 8. E331-00(2009) - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
 9. F2912-17 – Standard Specification for Glazing and Glazing Systems Subject to Airblast Loadings
- F. National Association of Architectural Metal Manufacturers (NAAMM):
1. AMP 500-06 - Metal Finishes Manual.
- G. U.S. Department of Veterans Affairs (VA):
1. VA-PSRDM - Physical Security and Resiliency Design Manual, October 1, 2020
- H. WINGARD PE – Window Glazing Analysis Response and Design, Professional Edition, Version 6.0 or later.

1.4 PREINSTALLATION MEETINGS

- A. Conduct preinstallation meeting minimum 30 days before beginning Work of this Section.
1. Required Participants:
 - a. Contracting Officer's Representative.
 - b. Architect/Engineer.
 - c. Contractor.
 - d. Installer.
 2. Meeting Agenda: Distribute agenda to participants minimum 3 days before meeting.
 - a. Installation schedule.
 - b. Installation sequence.
 - c. Preparatory work.
 - d. Protection before, during, and after installation.

- e. Installation.
 - f. Transitions and connections to other work.
 - g. Inspecting and testing.
 - h. Other items affecting successful completion.
3. Document and distribute meeting minutes to participants to record decisions affecting installation.

1.5 SUBMITTALS

- A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.
- B. Submittal Drawings:
- 1. Show dimensioned details of window and skylight units, including intended metal and glazing materials. 1: 20 (Three quarter inch equals 1 foot) scaled elevations showing interior and exterior. Indicated how window units can be replaced or removed, including replacement of glazing.
 - 2. Show detailed sections at 1: 5 (3 inch equal 1 foot) scale for members; indicating construction, size, and thickness of components, together with connections, fasteners, and means of separating dissimilar metals.
 - 3. Provide final submittal drawings as DWG AutoCAD files.
- C. Submittal Calculations:
- 1. Prior to performing engineering calculations, submit a description of the technique(s) that shall be employed to calculate the response of the system to the defined loading. Calculation package is to include a summary sheet briefly outlining the following:
 - a. Evaluation criteria
 - b. Calculation assumptions
 - c. Table of results by window type/location
 - d. Statement of Conformance with specification requirements

2. Calculation submittal is to be stamped and signed by a registered Professional Engineer whose qualifications meet or exceed that of the Quality Assurance section of this specification.
3. Calculations must include, but may not be limited to, analysis of the following:
 - a. Mullions and framing members: Provide a clear load path from the glass to the primary element and supporting analysis which illustrates each component's ability to transfer the design load to the primary element.
 - b. Analysis of primary element shall illustrate flexural and shear capacity.
 - c. Analysis will include verification that the structural silicone sealant can hold the glass in the frame under design loads including rebound.
 - d. Mullion Stability: if support rotations of a mullion exceed 4 degrees, analysis is required to verify its ability to develop its plastic capacity without instability. Additional calculations must include, but may not be limited to, analysis of the following:
 - 1) Global performance of mullion. Analysis shall verify that the plastic moment of the mullion, acting in a composite manner with its individual components, can be attained under maximum calculated deflections. Fasteners between each component shall be designed for the plastic capacity of the mullion.
 - 2) Lateral torsional buckling. Analysis shall verify the ability of the mullion to provide adequate resistance against lateral torsional buckling under maximum calculated deflections.
 - 3) Local buckling. Analysis shall verify the ability of the mullion and its individual components and connections to provide adequate resistance against localized buckling along the entire load path under maximum calculated deflections.
 - e. Anchorage: Analyze the strength of embedded anchor assembly, as well as pull-out and reaction forces shared with the building structure. Analyze the wall

anchor clip inserts and fasteners and assemblies, including bolts and stiffeners.

Include exact loadings to be transferred to the building structure in the analysis.

4. Mechanical Anchors: Mechanical anchor capacities shall be developed from dynamic testing. An International Code Council (ICC-ES) evaluation report showing testing for dynamic loading (i.e., seismic or blast) is to be submitted with calculations.

D. Manufacturer's Literature and Data:

1. Description of each product, metal, and alloy when applicable.
2. Indicate manufacturer's recommendations for fasteners, welding, applied finishes, hardware and accessories.
3. Installation instructions.
4. Standard color chart.

E. Sustainable Construction Submittals:

1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.

F. Certificates: Indicate each product complies with specifications.

1. Window blast resistance.

G. Qualifications: Substantiate qualifications comply with specifications.

1. Manufacturer with project experience list.
2. Installer with project experience list.
3. Blast engineer with project experience list.
4. Welders and welding procedures.

1.6 QUALITY ASSURANCE

A. Manufacturer and Installer Qualifications:

1. Regularly manufactures and installs specified products.
2. Manufactured and installed specified products with satisfactory service on five similar installations for minimum five years.
 - a. Provide contact names and addresses for completed projects when requested by Contracting Officer's Representative.

- B. Engage an Engineering Professional to perform dynamic analysis of the Blast Resistant system. The Engineer shall have a minimum of 5 years' experience performing dynamic analysis for blast resistant design and demonstrable experience designing blast resistant glazing systems in the past 18 months.
- C. Welders and Welding Procedures Qualifications:
 - 1. Stainless Steel: AWS D1.6/D1.6M.
 - 2. Steel: AWS D1.1/D1.1M.
 - 3. Sheet Steel: AWS D1.3/D1.3M.
- D. Window Bite: The required window system bite must be verified in the field.
- E. Installation Orientation: Curtain walls, storefronts, skylight, and doors delivered to the construction site are to be clearly labeled as to the proper installation orientation (i.e. laminated pane of glass to be installed as the interior pane.)

1.7 DELIVERY

- A. Deliver prefabricated unit in manufacturer's original sealed packaging.
- B. Mark packaging, legibly. Indicate manufacturer's name or brand, unit type, and manufacture date.
- C. Before installation, return or dispose of products within distorted, damaged, wet, or opened packaging.

1.8 STORAGE AND HANDLING

- A. Store products indoors in dry, weathertight facility.
- B. Protect products from damage during handling and construction operations.

1.9 FIELD CONDITIONS

- A. Field Measurements: Verify field conditions affecting window fabrication and installation. Show field measurements on Submittal Drawings.
 - 1. Coordinate field measurement and fabrication schedule to avoid delay.

1.10 WARRANTY

- A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

- A. Design windows complying with specified performance:
 - 1. Comply with VA-PSRDM Life-Safety Protected (LSP) level of protection requirements.
 - 2. Provide indicated levels of resistance for blast resistant window assemblies. Resistance level applies to anchorages, interfaces with adjoining substrates, glass retention, and hardware.
 - 3. Provide combined performances within rating limitations knowing certain attacks can result in severe damage to unit and require replacement.
- B. Blast Resistant Assemblies: Manufacturer's window and skylight unit assembled with panels, inserts, glazing, framing and anchorage shall be designed in accordance with the following performance requirements:
 - 1. Dynamic analysis using single-degree-of-freedom methods shall be employed in the design of exterior glazing systems and interior entrance vestibule as indicated on the drawings. The specified blast design load shall be applied over the areas tributary to the element being analyzed, including doors and spandrels.
 - 2. Blast Design Load: glazing, mullions, frames, and anchorage shall be designed for a linear ramp-down time-history load based on the following parameters:
 - a. Peak pressure, $P_r = 4\text{-psi}$
 - b. Impulse, $I_r = 28\text{-psi-msec}$
 - c. Duration, $t_d = 14\text{-msec}$
 - 3. Glazing shall meet the following performance in response to the Blast Load:
 - a. Windows: Fragments must enter the occupied space and land on the floor no further than 10 feet (3 m) from the façade. In WINGARD 6.0 this is equivalent to Performance Condition 3b based on a dynamic probability of failure value of 500 breaks per 1,000 or less.

- b. Skylights: Glazing may fracture but is fully retained by the window frame or glazing system. In WINGARD 6.0 this is equivalent to Performance Condition 3b based on a dynamic probability of failure value of 500 breaks per 1,000 or less.
- 4. Balanced Design Load: mullions, frames and anchorage shall be designed to accept a blast load equal to the maximum capacity of the weakest lite of supported glass up to disengagement from frame, WINGARD Performance Condition 2.
- 5. Design of mullions and frame elements shall not to exceed the following deformation limits:
 - a. Blast Load: $L/20$ (approx. 6-degrees)
 - b. Balanced Design Load: $L/14$ (approx. 8-degrees)
 - c. Shear demand-to-capacity ratio of 1.0
- 6. Section Modulus: The plastic section modulus may be used in dynamic design calculations.
- 7. Built-Up Sections: Section properties of a built-up member consisting of individual components of same or a combination of materials (i.e., steel and aluminum) shall be determined based on the following:
 - a. Ultimate stress and strain compatibility between individual member components shall be accounted for through industry standard methods of analysis.
 - b. Composite section properties may only be used if calculations demonstrate full shear stress transfer along the line of contact between individual member components.
 - c. Combined section properties may only be used if calculations demonstrate deformation compatibility between aluminum and steel components.
- 8. All flexural elements and their connections must be designed and detailed such that no brittle failure mode limits the capacity of the section as specified herein in subparagraph 1.5.C.3.d. Unless the element is designed to remain elastic in response to blast loading, ductile failure modes must be the governing failure mode for flexural elements and their connections and splices. Should elements be

designed elastically, the design of non-ductile modes of failure must include a 1.5 factor of safety on the calculated forces.

9. Connections and Anchorage: Use LRFD methods for the interconnection of framing members (i.e., mullions) and their anchorage to supporting structure. The total reaction force shall include the sum of mullion reactions and/or glazing peak edge shears. Mullion end reaction may be the lesser of its yield capacity or glazing peak edge shears along its length.
- C. Thermal Movement: Assembly capable of withstanding thermal movements resulting from ambient range of 67 degrees C (150 degrees F) to 82 degrees C (180 degrees F).
- D. Design Performance: Comply with structural performance, air infiltration, and water penetration requirements indicated in AAMA/WDMA/CSA 101/I.S.2/A440 for AW Class.
 1. Wind Load Resistance: ASCE/SEI 7; Design criteria as indicated on Drawings.
 2. Water Infiltration: ASTM E331; no uncontrolled penetration at 300 Pa (6.2 psf), minimum, pressure differential.
 3. Air Infiltration: ASTM E283; Maximum 0.1 cu. Ft./min./sq. ft. at static pressure difference of 300 Pa (6.2 psf).
- E. Supporting Structure: Coordination of the window/supporting structure and door/supporting structure interaction shall be the contractors' responsibility. The contractor's engineer performing blast calculations shall coordinate loading scenarios with the SEOR.

2.2 MATERIALS

- A. Framing Members:
 1. Extruded aluminum sections and/or continuous structural steel sections shall be used. Member yield strength may be increased by the application of an average static increase factor (SIF) and dynamic increase factor (DIF) accounting for material enhancement due to strain-rate effects under blast loading as follows:
 2. Aluminum Extrusions [5 mm (3/16-in.) minimum thickness]: ASTM B221.
 - a. Alloy 6063-T5: $f_y = 16$ ksi, SIF = 1.31, DIF = 1.02
 - b. Alloy 6063—T6: $f_y = 25$ ksi, SIF = 1.24, DIF = 1.02

- c. Alloy 6061-T6: $f_y = 35$ ksi, SIF = 1.14, DIF = 1.02
- 3. Steel Shapes/Plates/Bars:
 - a. ASTM A36/A36M: $f_y = 36$ ksi, SIF = 1.10, DIF = 1.29
 - b. ASTM A992 & A572, GR 50: $f_y = 50$ ksi, SIF = 1.05, DIF = 1.19
 - c. ASTM A500, GR B: $f_y = 46$ ksi, SIF = 1.056, DIF = 1.19
- B. Aluminum Trim and Stops: ASTM B221.
 - 1. Alloy 6063-T5, -T6, or -T52; 1.5 mm (1/16 inch) minimum thickness
- C. Stainless Steel Trim: ASTM A666, Type 304; formed stainless steel.
- D. Steel Shapes/Plates/Bars: ASTM A36/A36M, except where another designation is indicated.
- E. Bolts and Fasteners: ASTM A320/A320M; Type 300-series stainless steel screws, bolts, nuts, and washers. Non-removable type where accessible from attack side.
- F. Window Cleaner's Bolts: Nonmagnetic stainless steel, complying with safety regulations for window cleaning equipment.
- G. Glazing Materials: Rated laminated assembly as specified herein in subparagraph 2.4.C. and Section 08 80 00, GLAZING.
- H. Structural Silicone Sealant: Ultimate Tensile Stress per ASTM C1135
 - 1. Minimum 170 psi in tension
 - 2. Ultimate tensile strength may be increased by a factor of 1.18 to account for blast loading dynamic strain rate effects

2.3 PRODUCTS - GENERAL

- A. Provide blast resistant windows from one manufacturer.
- B. Sustainable Construction Requirements:
 - 1. Steel Recycled Content: 30 percent total recycled content, minimum.
 - 2. Stainless Steel Recycled Content: 70 percent total recycled content, minimum.
 - 3. Aluminum Recycled Content: 80 total recycled content, minimum.

2.4 FABRICATION

- A. Assemblies: Shop fabricate matching profiles indicated on Drawings. Make welds that comply with AWS standards; exposed welds ground smooth. Provide welded-in-place reinforcements and anchorage devices.
 - 1. Removable Glazing Stops: Applied to room side of window.
 - a. Miter and weld removable stops at corners.
 - b. Secure removable stops to frames with countersunk screws, spaced as required for specified performance requirements.
 - 2. New Building: Frame system with inner frame, outer frame, and fasteners to connect frames together.
 - a. Fabricate continuous outer frame for concrete embedment light-gage steel frame attachment as exterior wall is constructed.
 - b. Preassemble inner frame with glazing for bolting to outer frame.
 - c. Provide both frames shall be supplied by one manufacturer.
 - d. Anchorage: Provide anchors with the following:
 - 1) Yield strength: 900 MPa (130,000 psi).
 - 2) Tensile strength: 1033 MPa (150,000 psi).
- B. Unit Anchorages: Fabricate metal anchorage system complying with performance requirements.
- C. Unit Glazing:
 - 1. Laminated glass assembly meeting a minimum make-up of ¼-in outer monolithic lite, ½-in. air gap, ¼-in inner laminated lite consisting of two 1/8-in. glass layers bonded together by a 0.030-in. PVB interlayer, as specified in Section 08 80 00, GLAZING.
 - 2. Window Bite: Provide a minimum ½-in. bite and 3/8-in. wide continuous bead of structural silicone adhesive attaching inner lite of glass to frame for development of post-damage capacity. Alternatively, a dry-glazed system may be used provided it is demonstrated by analysis to meet the performance requirements in response to the specified blast load.

2.5 FINISHES

- A. General: Finish fabricated units including framing, sub-framing, hardware, and accessories.
 - 1. Color Refer to Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Steel Surfaces: ASTM A123/A123M galvanized.
- C. Stainless Steel: NAAMM AMP 500; No. 4 polished finish, except retain manufacturer's standard mill finish on exposed fasteners and similar devices.
- D. Blend welds to match adjacent finish.
- E. Aluminum Anodized Finish: NAAMM AMP 500.
 - 1. Clear Anodized Finish: AA-C22A41; Class I Architectural, 0.7 mil thick.
 - 2. Color Anodized Finish: AA-C22A42 or AA-C22A44; Class I Architectural, 0.7 mil thick.

2.6 ACCESSORIES

- A. Bituminous Paint: SSPC Paint 12 (cold-applied asphalt mastic).
- B. Welding Materials: Type to suit application for color match, strength and compatibility in fabricated item.
 - 1. Stainless Steel: AWS D1.6/D1.6M, TIG using rods made from alloyed Type 308 stainless steel.
 - 2. Steel: D1.1/D1.1M.
 - 3. Steel Sheet: D1.3/D1.3M-08.
- C. Galvanizing Repair Paint: MPI No. 18.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine and verify substrate suitability for product installation.
 - 1. Verify opening is correctly sized and located.
 - 2. Verify substrate is prepared to receive frame anchors.
- B. Protect existing construction and completed work from damage.

- C. Apply bituminous coating approximately 30 mils dry film thickness, or other suitable permanent separator, on surfaces of dissimilar metals, and metal surfaces in contact with concrete.
 - 1. Where the metals are exposed to view, provide a plastic or neoprene separator between dissimilar metals.

3.2 INSTALLATION

- A. Install products according to manufacturer's instructions and approved submittal drawings.
- B. Install window units according to manufacturer's installation instructions.
- C. Set units accurately, plumb, and level.
- D. Securely anchor to concrete sill and light-gage façade as shown on design drawings to withstand specified performance.
 - 1. Anchor Diameter: 3/8 inch minimum.
 - 2. Minimum Embedment and Edge Distances:
 - a. Embedment in Concrete: 3-1/2 inches.
 - b. Edge Distance: 3 inches.
 - 3. Avoid cutting rebar during concrete anchor installation.
- E. Touch up damaged factory finishes.
 - 1. Repair galvanized surfaces with galvanized repair paint.

3.3 CLEANING

- A. Clean exposed window surfaces. Remove temporary labels, contaminants, and stains.
- B. Clean glazing according to Section 08 80 00, GLAZING.

3.4 PROTECTION

- A. Protect window units from construction operations.
- B. Remove protective materials immediately before acceptance.
- C. Repair damage.

-- E N D --

**SECTION 08 71 00
BUILDERS HARDWARE**

PART 1 - GENERAL

1.1 DESCRIPTION

Builder's hardware and related items necessary for complete installation and operation of doors.

1.2 RELATED WORK

- A. Application of Hardware: Section 081400 WOOD DOORS, 081113 STEEL DOORS AND FRAMES
- B. Sealant: Section 079200, SEALANTS AND CAULKING.
- C. Painting: Section 099100, PAINTING.

1.3 GENERAL

- A. All hardware shall comply with UFAS, (Uniform Federal Accessible Standards) unless specified otherwise.
- B. Hardware for Labeled Fire Doors and Exit Doors: Hardware shall conform to requirements of NFPA 80 for labeled fire doors and to NFPA 101 for exit doors, as well as to other requirements specified. Provide hardware listed by UL, except where heavier materials, larger sized, or better grades are specified herein under paragraph HARDWARE SETS. In lieu of UL labeling and listing, test reports from a nationally recognized testing agency may be submitted showing that hardware has been tested in accordance with UL test methods and that it conforms to NFPA requirements.
- C. Hardware for application on metal and wood doors and frames shall be made to standard templates. Furnish templates to the fabricator of these items in sufficient time so as not to delay the construction.
- D. Each hardware type shall be of the same manufacturer, except as otherwise specified.

1.4 SUBMITTALS

- A. Submit in accordance with Section 013323, SAMPLES AND SHOP DRAWINGS.
- B. Hardware Schedule: Contractor is responsible for coordinating and verifying schedule. Prepare and submit hardware schedule in the following form:

Hardware Item	Quantity	Size	Reference Publication Type No.	Finish	Mfr. Name and Catalog No.	UL Mark (if fire rated and listed)	ANSI/BHMA Finish Designation
------------------	----------	------	--------------------------------------	--------	------------------------------------	--	------------------------------------

- C. Certificate of Compliance and Test Reports: Submit certificates that hardware conforms to the requirements specified herein. Certificates shall be accompanied by copies of reports as referenced. The testing shall have been conducted either in the manufacturer's plant and certified by an independent testing laboratory or conducted in an independent laboratory, within four years of submittal of reports for approval.

1.5 DELIVERY AND MARKING

Deliver items of hardware to job site in their original containers, complete with necessary appurtenances including screws, keys, and instructions.

1.6 INSTRUCTIONS

- A. Hardware Set Symbols on Drawings: Except for protective plates, door stops, mutes, thresholds and the like specified herein, hardware requirements for each door are indicated on drawings by symbols. Symbols for hardware sets consist of letters "HW" followed by a number. Each number designates a set of hardware items applicable to a door type.
- B. Manufacturers' Catalog Number References: Where manufacturers' products are specified herein, products of other manufacturers that are considered equivalent to those specified may be used provided they are approved "equal" products.

Manufacturers whose products are specified are identified by abbreviations as follows:

FINISH HARDWARE DATA SHEET: Acceptable Manufacturers.

Butts and Hinges:	Bommer, Hager, Henry Soss, Lawrence, McKinney, Stanley
Locks and Electric Locks:	Best*, proprietary manufacturer
Threshold and Header Bolts:	Glynn Johnson*, Stanley, Quality, Adams Rite, Hager
Exit Devices:	Von Duprin*

Overhead Closers and Electromagnetic Door Holders:	LCN*, Norton*
Stops, Bumpers, Mutes, Door Peeps, and Floor-Wall Holders:	Brookline, Glynn-Johnson, Ives, Quality*, Hager, Rixson*
Door Stripping and Seals:	Pemko, National Guard*, Reese, Zero, Hager
Thresholds:	Pemko, National Guard*, Reese*, Zero, Hager

*Asterisk denotes manufacturers referenced in this specification. See substitution requirements in Division 1 for "or equal" products.

- C. Keying: All cores shall be keyed into the existing facilities Great Grand Master Key System. Provide Best removable cores that are removable only with a control key, without disassembly of knob or lockset. Cylinders and core housings shall accept Best 7 pin cores. The VA will change out the contractor supplied construction cores and exchange with Best for final combined cores to be keyed to the facilities Great Grand Master Key System.

1.7 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only. In text, hardware items are referred to by series, types, etc., listed in such specifications and standards, except as otherwise specified.
- B. American Society for Testing and Materials (ASTM):
F883-1997Padlocks
- C. Builders Hardware Manufacturers Association Inc.
A156.1-1997Butts and Hinges
A156.2-1996.....Bored and Preassembled Locks and Latches
A156.3-1994.....Exit Devices (BHMA 701)
A156.4-1992.....Door Controls (Closers) (BHMA 301)
A156.5-1992.....Auxiliary Locks and Associated Products (BHMA 501)
A156.6-1994.....Architectural Door Trim (BHMA 1001)

- A156.8-1994.....Door Controls-Overhead Stops and Holders (BHMA 311)
- A156.13-1994.....Mortise Locks and Latches (BHMA 621)
- A156.15-1995.....Closer Holder Release Devices
- A156.16-1997.....Auxiliary Hardware
- A156.18-1993.....Materials and Finishes (BHMA 1301)
- A156.21-1996.....Thresholds
- D. Steel Door Institute (SDI)
 - 100-1991Standard Steel Doors and Frames
- E. National Fire Protection Association (NFPA):
 - 80-1995Standard for Fire Doors and Windows
 - 101-1997Life Safety Code
- F. Underwriters Laboratories, Inc. (UL):
 - Building Materials Directory (1998)

PART 2 - PRODUCTS

2.1 BUTT HINGES

- A. ANSI A156.1. The following five knuckle ball bearing types of butt hinges shall be used for the types of doors listed, except where otherwise specified.
 - 1. Exterior Doors: Type A2112 for doors 900 mm (3 feet) wide or less. Type A2111 for doors over 900 mm (3 feet) wide. Hinges for exterior doors shall have non-removable pins.
 - 2. Interior Doors: Standard full mortise hinge shall be Type A8112 for doors 900 mm (3 feet) wide or less. Type A8111 for doors over 900 mm (3 feet) wide. Clear swing full mortise hinge shall be Type A8122 for doors 900 mm (3 feet) wide or less. Type A8121 for doors over 900 mm (3 feet) wide.
 - 3. Automatic doors hung on butts, provide Type A2111 for exterior doors and aluminum doors, and Type A8111 for other doors.

4. Any door installed in structural steel frames: Type A2412, A8412, A2411, or A8411 as applicable, except where otherwise specified. Such hinges shall be of same quality and weight as other hinges listed above for applicable door sizes.
5. Labeled Wood Fire Doors: Type A8112 or A8122 for doors 900 mm (3 feet) wide or less. Type A8111 or A8121 for doors over 900 mm (3 feet) wide.
- B. See Articles "MISCELLANEOUS HARDWARE" and "HARDWARE SETS" for pivots and hinges other than butts specified above.

2.2 DOOR CLOSING DEVICES

Closing devices shall be products of one manufacturer.

2.3 OVERHEAD CLOSERS

- A. ANSI A156.4, Grade 1.
- B. Closers shall conform to the following:
 1. The closer shall have 50 percent adjustable closing force over minimum value for that closer and have adjustable hydraulic back-check effective between 60 degrees and 85 degrees of door opening.
 2. Closer shall be equipped with adjustable hold-open feature having a range up to 180 degrees, unless otherwise specified. Hold-open arm to include cushion-stop feature.
 3. Size Requirements: Size closer in accordance with manufacturer's printed recommendations. Comply with UFSA and VA accessibility requirements.
 4. Material of closer shall be forged or cast iron or cast aluminum.
 5. Arm, fasteners, and brackets for closer shall have a plated finish over steel, malleable iron or high strength ductile cast iron.
 6. Closer shall have full size metal cover.
 7. Closer shall have adjustable hydraulic back-check and separate valves for closing and latching speed.
 8. Closer for stairwell doors and smoke/fire doors held open by electromagnetic hold opens shall not have the adjustable hold-open feature.

9. Closer shall be Series 8500 with parallel arm as manufactured by Norton, or approved equal.

2.4 FLOOR CLOSERS AND FLOOR PIVOT SETS

- A. ANSI A156.4. Provide stainless steel floor plates for floor closers and floor pivots, except where metal thresholds occur. Provide cement cast for all floor closers. Floor closers specified for fire doors shall comply with Underwriters Laboratories, Inc.; requirements for concealed type floor closers for classes of fire doors indicated on drawings. Hold-open mechanism, where required, shall engage when door is opened 105 degrees, except when door swing is limited by building construction or equipment, the hold-open feature shall engage when door is opened approximately 90 degrees. Floor closers shall have adjustable hydraulic back-check. Single acting floor closers shall also have built in dead stop. Pivots for non-labeled doors shall be cast, forged or extruded brass or bronze.
- B. Where floor closer appears in hardware set provide the following as applicable.
 1. Double Acting Floor Closers: Type C06012.
 2. Single Acting Floor Closer: Type C06021 (center pivoted). (Intermediate pivot is not required).
 3. Single Acting Floor Closers: Type C06041 (offset pivoted).
 4. Single Acting Floor Closer for Labeled Fire Doors: Type C06051 (offset pivoted).
 5. Single Acting Floor Closer For Lead Lined Doors: Type C06061 (center pivoted). (Intermediate pivot is not required).
 6. Single Acting Floor Closers For Lead Lined Doors: Type C06071 (offset pivoted).

2.5 COMBINATION CLOSER - HOLDER

- A. ANSI A156.15. Combination closer-holder with built-in electronic release.
- B. Combination closer-holder shall have the following features:
 1. Control door closing and latching sequence by hydraulic action.
 2. Wiring for 24V DC current. Current draw shall not exceed 0.16 amperes.
 3. Double level arm closing action, and adjustable hydraulic back-check.

4. Spring power for closing force shall conform to ANSI A156.4 and have 50% spring power adjustment.
5. Closer Size Requirements:
 - a. Doors, 900 mm (3 feet) and less in width: Size III closer.
 - b. Doors over 900 mm (3 feet) and less than 1050 mm (3 feet 6 inches) in width: Size IV closer.
 - c. Doors 1050 mm (3 feet 6 inches) and over in width: Size V closer.
6. Hold-open mechanism shall hold door open between 85 degrees and 180 degrees depending on wall and frame conditions. Mount device to provide maximum door opening permitted by building construction or equipment.
7. Electronic release shall release door when signaled by smoke detector. Smoke detectors shall not be incorporated as an integral part of door holders. Smoke detectors are specified in the ELECTRICAL Section.
8. All closers to have full size metal covers.

2.6 DOOR STOPS

- A. ANSI A156.16.
- B. Provide door stops wherever an opened door or any item of hardware thereon would strike a wall, column, equipment or other parts of building construction. For metal stud and/or metal furring with dry wall construction provide solid wood backing for mounting door stops. For concrete, masonry or quarry tile construction, use lead expansion shields for mounting door stops.
- C. Where cylindrical locks with turn pieces or pushbuttons occur, equip wall bumpers Type L22251 (rubber pads having concave face) to receive turn piece or button.
- D. Substitute floor stops Type L22141 or L22161 as appropriate, when wall bumpers would not provide an effective door stop.
- E. Provide stops Type L22011 or L22181, as applicable for exterior doors.
- F. Omit stops where overhead door hold/stop are required.

- G. Provide appropriate roller bumper for each set of doors (except where closet doors occur) where two doors would interfere with each other in swinging.
- H. Provide appropriate door mounted stop on doors in individual toilets where floor or wall mounted stops cannot be used.
- I. Provide overhead surface applied stop Type C25541, ANSI A156.8 on patient toilet doors in bedrooms where toilet door could come in contact with the bedroom door.
- J. Provide door stops on doors where combination closer magnetic holders are specified.

2.7 OVERHEAD DOOR HOLD/STOP

- A. ANSI Standard A156.8. Overhead door hold/stop shall be of sizes recommended by door hold/stop manufacturer for each width of door. Set overhead door hold/stop for 110 degree opening, unless limited by building construction or equipment.
- B. Overhead door hold/stop shall be Heavy-duty 9 Series as manufactured by Rixson, or approved equal.

2.8 (NOT USED) FLOOR DOOR HOLDERS

2.9 LOCKS AND LATCHES

- A. ANSI A156.2. Locks and latches for doors 45 mm (1¾ inch) thick or over shall have beveled fronts. Permanent figure eight cores shall be Best 7 pin type. The contractor shall purchase all permanent cores for the new locksets required in this project from Best. Cylinders and core housings for all locksets shall accept Best figure eight removable cores. Figure eight cores shall be removable only with a control key. Construct all cores so that they will be interchangeable into the core housings of all mortise locks, rim locks, cylindrical locks, and any other type lock included in the VA Great Grand Master Key System. Disassembly of lever or lockset shall not be required to remove core from lockset. All locksets or latches on double doors with a fire rated label shall have latch bolts with 19 mm (¾ inch) throw. All lock cases installed on lead lined doors shall be lead lined before applying final hardware finish. The VA will contact Best at the time when locksets are required to be combined. Using the permanent cores

purchased by the contractor, Best will combine and key these cores to the facility's Great Grand Master Key System and send them directly to the VA for installation.

B. In addition to above requirements, locks and latches shall comply with following requirements:

1. Mortise Lock and Latch Sets: Mortise locksets shall be Best Heavy-duty, 35H series. All locksets and latches shall have Best 15 lever style with S rose trim style. Refer to 3.3 HARDWARE SETS for specified function of lock and latch set.
2. Mortise Deadlock: Mortise deadlock shall be Best Heavy-duty, 38H series. Refer to 3.3 HARDWARE SETS for function of lock.
3. Cylindrical Lock And Latch Sets: Levers shall meet ADA (Americans with Disabilities Act) requirements. Cylindrical locksets shall be Best 93K series 4000 Grade 1. All locksets shall have Best 15 lever style with D rose trim style. Refer to 3.3 HARDWARE SETS for specified function of lock and latch set.
4. Auxiliary locks shall be as specified herein under paragraph HARDWARE SETS and conform to ANSI A156.5.

2.10 (NOT USED) ROLLER LATCHES

2.11 KEYS

The contractor shall provide to the VA one (1) control key and two (2) operating keys, for each different Best series removable metal construction color-coded core used, prior to installation of locks.

2.12 (NOT USED) KEY CABINET

2.13 ARMOR PLATES, COMBINATION KICK-MOP PLATES AND DOOR EDGING

- A. ANSI Standard A156.6.
- B. Provide protective plates and door edging as specified below:
 1. Kick-mop plates and armor plates metal, Type J100 series, 1.6 mm (.062 inch) minimum gauge metal, with beveled edges.
 - a) Provide kick-mop plates for both sides of each new door, except where noted as not required. Kick-mop plates shall be 254 mm (10 inches) high. On push side of doors where jamb stop extends to floor, make combination kick-mop plates 38

mm (1½ inches) less than width of door, except pairs of metal doors which shall have plates 25 mm (1 inch) less than width of each door. Extend all other combination kick-mop plates to within 6 mm (¼ inch) of each edge of doors. Kick mop plates shall butt astragals. For jamb stop requirements, see specification sections pertaining to doorframes.

b) Kick-mop plates are not required on following door sides:

Armor plate side of doors

Exterior side of exterior doors

Closet side of closet doors

Storage side of doors to or from storage spaces

Both sides of aluminum entrance doors

c) Armor plate for doors is listed under Article "Hardware Sets". Armor plates shall be 875 mm (35 inches) high and 38 mm (1½ inches) less than width of doors, except on pairs of metal doors. Plates on pairs of metal doors shall be 25 mm (1 inch) less than width of each door. Where top of intermediate rail of door is less than 875 mm (35 inches) from door bottom, extend armor plates to within 13 mm (½ inch) of top rail. On doors equipped with panic devices, extend armor plates to within 13 mm (½ inch) of panic bolt cross bar.

d) Where louver or grille occurs in lower portion of doors, substitute stretcher plate and kick-mop plate in place of armor plate. Size of stretcher plate and kick-mop plate shall be 200 mm (8 inches) high.

2. Door edging metal, Type J200 series, 1.3 mm (.050 inch) minimum gauge metal. Provide 'U' shaped channels at both edges of each armor plated wood door. Install channels with 22 mm (7/8 inch) leg on faces of door and extend full thickness of door mortised into the edge. Stagger screws for securing channels 400 mm (eight inches) on centers in door edges. Extend channels from bottom of door to top of door and cut out for butt hinges and flush bolts specified for the door. Armor plates shall overlap door edging.

2.14 (NOT USED) EXIT DEVICES

2.15 (NOT USED) FLUSH BOLTS (LEVER EXTENSION)

2.16 (NOT USED) FLUSH BOLTS (AUTOMATIC)

2.17 DOOR PULLS

ANSI A156.6. Pull handle and plate metal. Pull handle, Type J400 series, 19 mm (3/4 inch) diameter base, 57 mm (2¼ inch) projection, 38 mm (1½ inch) clearance, 203 mm (8 inches) length center to center. Plate metal, Type J300 series, 1.3 mm (.050 inch) minimum gauge metal, 102 mm (4 inches) wide by 406 mm (16 inches) high, square corners beveled. Secure plates to wood doors with 38 mm (1½ inch) long No. 12 wood screws. Cut plates of door pulls for cylinders, or turn pieces where required.

2.18 PUSH PLATES

ANSI A156.6. Plate metal, Type J300 series, 1.3 mm (.050 inch) minimum gauge metal, 203 mm (8 inches) wide by 406 mm (16 inches) high, square corners beveled, unless otherwise specified. Provide metal plate 152 mm (6 inches) wide where push plates are specified for doors with stiles between 229 mm (9 inches) and 203 mm (8 inches) wide, and 102 mm (4 inches) wide where push plates are specified for doors with stiles less than 203 mm (8 inches) wide. Cut plates for cylinders, and turn pieces where required.

2.20 (NOT USED) COORDINATORS

2.21 THRESHOLDS

- A. Exterior Metal Thresholds: ANSI A156, 4 except as otherwise specified. Thresholds shall be installed in a bed of sealant with machine screws and expansion shields. For sealant see Section, SEALANT AND CAULKING. Furnish thresholds where following conditions occur.
1. Exterior openings at entrance for wheel chair use: Threshold No. 818 CP as manufactured by National Guard Products Inc. or approved equal. Threshold shall be 200 mm (8 inches) wide by length of opening.
 2. Exterior openings having doors hung on floor hinges: Threshold Type C38081.

3. Exterior openings having doors equipped with vertical rod type panic devices and hung on butt hinges: Threshold No. S250 AC as manufactured by Reese Enterprise, Inc. or approved equal.
 4. Exterior openings having doors equipped with butt hinges without vertical rod exit devices: Threshold No. S2058A as manufactured by Reese Enterprise, Inc. or approved equal.
- B. Interior Metal Thresholds: ANSI A156.6, Type J601, without stop, fabricated of extruded aluminum. Cut thresholds to closely fit jambs. Drill and cut for door holders and bottom bolts where required. Anchor with 6 mm by 50 mm (¼ inch by 2 inches), countersunk, flathead machine screws, with expansion shields, two at each end at intermediate points not over 300 mm (12 inches) on centers. For caulking of thresholds see Section, SEALANTS AND CAULKING.
- C. For thresholds at elevator entrances see other sections of specifications.

2.22 AUTOMATIC DOOR BOTTOM SEAL AND RUBBER GASKET

Automatic door bottom seals as noted in the HARDWARE SETS shall have an exposed case or housing of extruded aluminum, 1.5 mm (0.063 inch) thick with chemically etched medium matte finish, natural satin anodized .01 mm (0.4 mils) thick, to match finish specified for hardware on door. Automatic door bottom shall be National Guard Products Series 420 or approved equal. Parts other than those specified above shall be zinc or nylon, except that operating springs shall be of spring steel. Housing shall contain operating mechanism consisting of removable metal strip having lower edge of heavy felt or closed cell sponge neoprene. When strip is activated by rod protruding from door bottom, strip shall lift when door is opened and drops to floor when door is closed, providing a light proof seal at bottom of door.

2.23 WEATHERSTRIPS (FOR EXTERIOR DOORS)

- A. Heads and Jambs: Provide closed cell sponge neoprene strips 27 mm (1-1/16 inches) wide by 5 mm (3/16 inch) thick with beveled edge, extruded aluminum retainer 1.8 mm (0.070 inch) thick by 32 mm (1-1/4 inches).

- B. Meeting Stiles of Pairs of Doors: Provide astragal consisting of two beveled edge solid neoprene strips 3 mm (1/8 inch) thick with extruded aluminum retainers, 1.8 mm by (0.070 inch) thick by 32 mm (1¼ inches wide).
- C. Raindrips: Provide and install extruded aluminum 22 mm (0.88 inch) thick raindrips with 63 mm (2½ inch) projection at heads of door frames not protected by canopy or soffit.
- D. Door Bottoms: Provide curved vinyl strips with extruded aluminum retainer similar to No. 14R as manufactured by National Guard Products, Inc. or approved equal.

2.24 MISCELLANEOUS HARDWARE

- A. Access Doors (including Sheet Metal, Screen and Woven Wire Mesh Types): Except for fire-rated doors and doors to Temperature Control Cabinets, equip each single or double metal access door with Lock Type E76213, conforming to ANSI A156.5. Key locks as directed. Ship lock prepaid to the door manufacturer. Door manufacturer shall provide hinges.
- B. Cylinders for Various Partitions and Doors: Key cylinders same as entrance doors of area in which partitions and door occur, except as otherwise specified. Provide cylinders to operate locking devices where specified for following partitions and doors:
 - Folding doors and partitions
 - Wicket door (in roll-up door assemblies)
 - Slide-up doors
 - Swing-up doors
 - Fire-rated access doors-Engineer's key set
 - Doors from corridor to electromagnetic shielded room
 - Day gate on vault door
- C. Mutes: ANSI A156.16. Provide door mutes or door silencers Type 1337A, of white or light gray color, on each new and repainted existing steel door frame, except lead-lined frames and frames for sound-resistant, lightproof and electromagnetically shielded doors. Furnish 3 mutes for single doors and 2 mutes for each pair of doors, except double-acting doors. Provide 4 mutes or silencers for frames for each Dutch type door.

Provide 2 mutes for each edge of sliding door, which would contact door frame. Mute No. 1337 A as manufactured by Quality or approved equal.

- D. Door Peeps or Viewers: ANSI A156.16. Viewer shall be Type 1755, solid brass with 26D finish, one way glass lens with 160-degree angle of view, and non-removable.
Manufactured by Hager or approved equal.

2.25 (NOT USED) PADLOCKS FOR VARIOUS DOORS, GATES AND HATCHES

2.26 (NOT USED) THERMOSTATIC TEMPERATURE CONTROL VALVE CABINETS

2.27 (NOT USED)HINGED WIRE GUARDS (FOR WINDOWS, DOORS AND TRANSOMS) AND WIRE PARTITION DOORS

2.28 (NOT USED) ELECTROMAGNETIC DOOR HOLDER

2.29 FINISHES

- A. Exposed surfaces of hardware shall have BHMA Standard 1301, finishes as specified below. Finishes on all hinges, pivots, closers, thresholds, etc., shall be as specified below under "Miscellaneous Finishes." For field painting (final coat) of ferrous hardware, see Section, PAINTING.
- B. US10/612-639 (Satin Bronze), US26D/626-652 (Satin Chrome), or US32D/630 (Satin Stainless Steel) finish: All surfaces on exterior and interior of buildings, except where other finishes are specified.
- C. Miscellaneous Finishes:
1. Hinges (exterior doors): US26D/626-652 (Satin Chrome) or US32D/630 (Satin Stainless Steel).
 2. Hinges (interior doors): US10/612-639 (Satin Bronze), US26D/626-652 (Satin Chrome), or US32D/630 (Satin Stainless Steel).
 3. Pivots: Match door trim.
 4. Door Closers: Factory applied finish US10/612-639 (Satin Bronze), US26D/626-652 (Satin Chrome), or US32D/630 (Satin Stainless Steel).
 5. Thresholds: Mill finish aluminum or dark bronze anodized aluminum to match door.
 6. Cover plates for floor hinges and pivots: Match door trim.

7. Other primed steel hardware: US10/612-639 (Satin Bronze), US26D/626-652 (Satin Chrome), or US32D/630 (Satin Stainless Steel).
- D. Color of Plastic Items: See Section, INTERIOR/EXTERIOR FINISHES, MATERIALS, AND FINISH SCHEDULES. Where colors other than chocolate brown or black are specified, color of core material may be different than color of face.
- E. Special Finish: Exposed surfaces of hardware for dark bronze anodized aluminum doors shall have oxidized oil rubbed bronze finish (dark bronze) finish on door closers shall closely match doors.

PART 3 - EXECUTION

3.1 HARDWARE HEIGHTS

- A. For existing buildings locate hardware on doors at heights to match existing hardware. The Contractor shall visit the site, verify location of existing hardware and submit locations to Resident Engineer for approval.
- B. Hardware Heights From Finished Floor For Hardware Types Not Already Existing:
 1. Exit devices centerline of strike (where applicable) 1000 mm (40-5/16 inches).
 2. Locksets and latch sets centerline of strike 1000 mm (40-5/16 inches).
 3. Deadlocks centerline of strike 1200 mm (48 inches).
 4. Hospital arm pull 1170 mm (46 inches) to centerline of bottom supporting bracket.
 5. Centerline of door pulls to be 1000 mm (40 inches).
 6. Push plates and push-pull shall be 1250 mm (50 inches) to top of plate.
 7. Push-pull latch to be 1000 mm (40-5/16 inches) to centerline of strike.
 8. Centerline of deadlock strike to be 840 mm (33 inches) when used with push-pull latch.
 9. Locate other hardware at standard commercial heights. Locate push and pull plates to prevent conflict with other hardware.
- C. Modifications necessitated by reason of construction, shall be submitted to the Project Engineer for approval prior to being made.
- A. For new buildings locate hardware on doors at heights specified below:

B. Hardware Heights From Finished Floor:

1. Exit devices centerline of strike (where applicable) 1000 mm (40-5/16 inches).
2. Locksets and latch sets centerline of strike 1000 mm (40-5/16 inches).
3. Deadlocks centerline of strike 1200 mm (48 inches).
4. Hospital arm pull 1170 mm (46 inches) to centerline of bottom supporting bracket.
5. Centerline of door pulls to be 1000 mm (40 inches).
6. Push plates and push-pull shall be 1250 mm (50 inches) to top of plate.
7. Push-pull latch to be 1000 mm (40-5/16 inches) to centerline of strike.
8. Centerline of deadlock strike to be 840 mm (33 inches) when used with push-pull latch.
9. Locate other hardware at standard commercial heights. Locate push and pull plates to prevent conflict with other hardware.

3.2 INSTALLATION

- A. Closer devices, including those with hold-open features, shall be equipped and mounted to provide maximum door opening permitted by building construction or equipment. Closers shall be mounted parallel arms. Where closers are mounted on doors they shall be mounted with machine screws to solid blocking; foot shall be fastened to frame with machine screws. Closer shall be installed on room side of door so that closer will not be visible from the corridor when door is closed.

B. Hinge Size Requirements:

Thickness of Door	Width of Door	Height of Hinge
45 mm (1-3/4 inch)	900 mm (3 feet) and less	113 mm (4½ inches)
45 mm (1-3/4 inch)	Over 900 mm (3 feet) but not more than 1200 mm (4 feet)	113 mm (4½ inches)

- C. Hinge leaves shall be sufficiently wide to allow doors to swing clear of doorframe trim.
- D. Where new hinges are specified for new doors in existing frames or existing doors in new frames, sizes of new hinges shall match sizes of existing hinges. Contractor may reuse existing hinges provided hinges meet specified type and style of new hinge and

are restored to satisfactory operating condition as approved by Resident Engineer.

Existing hinges shall not be reused on door openings having new doors and new frames.

Coordinate preparation for hinge cut-outs and screw hole locations on doors and frames.

E. Hinges Required Per Door:

Doors 1500 mm (5 ft) or less in height	2 butts
Doors over 1500 mm (5 ft) high and not over 2280 mm (7 ft 6 in) high and 900 mm (3 feet) wide and less	3 butts
Doors over 1500 mm (5 ft) high and not over 2280 mm (7 ft 6 in) high and over 900 mm (3 feet) but not more than 1200 mm (4 feet)	3 HvyDty butts
Doors over 2280 mm (7 feet 6 inches) high	4 butts
Dutch type doors	3 butts
Doors with spring hinges 1370 mm (4 feet 6 inches) high or less	2 butts
Doors with spring hinges over 1370 mm (4 feet 6 inches)	3 butts

F. Fastenings: Suitable size and type and shall harmonize with hardware as to material and finish. Provide machine screws and lead expansion shields to secure hardware to concrete, ceramic or quarry floor tile, or solid masonry. Fiber or rawl plugs and adhesives are not permitted. All fastenings exposed to weather shall be of nonferrous metal.

G. After locks have been installed; show in presence of Resident Engineer that the locksets operate their respective lock function in accordance with requirements. Installation of locks, which do not meet specified function requirements, shall be considered sufficient justification for rejection and replacement of locksets installed on project.

3.3 HARDWARE SETS

Following sets of hardware correspond to hardware symbols shown on drawings. Where hardware set for a single door is specified for a pair of doors; equip each leaf of such pair of doors with set noted. Only those hardware sets that are shown on drawings will be required.

HARDWARE SETS

ELECTRIC HARDWARE ABBREVIATIONS LEGEND:	
ADO	= Automatic Door Operator
EMCH	= Electro-Mechanical Closer-Holder
MHO	= Magnetic Hold-Open (wall- or floor-mounted)

INTERIOR SINGLE DOORS

HW-2H

Each Door to Have:

NON-RATED

- | | | |
|---|-----------------------------|--------------------------------------|
| 1 | Continuous Hinge | x INTEGRAL HINGE GUARD CHANNEL |
| | | X ADJUSTA-SCREWS |
| 1 | Hospital Privacy Latch | F02 X OCCUPANCY INDICATOR |
| 1 | Kick Plate | J102 |
| 1 | Mop Plate (@ Inswing Doors) | J103 |
| 1 | Edge Guard (@ Wood Doors) | J208M / J211 (VERIFY), CUT: HARDWARE |
| 1 | Overhead Stop | C01541-ADJUSTABLE |
| 3 | Silencers | L03011 |

STONE THRESHOLD BY OTHER TRADES.

HW-3E

Each Door to Have:

NON-RATED

Hinges	QUANTITY & TYPE AS REQUIRED
1 Office Lock	F04
1 Floor Stop	L02121 x 3 FASTENERS
1 Set Self-Adhesive Seals	R0Y154
1 Coat Hook	L03121

OMIT COAT HOOK WHERE GLASS LITE PREVENTS INSTALLATION

HW-3G

Each Door to Have:

NON-RATED

Hinges	QUANTITY & TYPE AS REQUIRED
1 Office Lock	F04
1 Floor Stop	L02121 x 3 FASTENERS
1 Coat Hook	L03121
1 Door Viewer (Mental Health Only)	L03221 – 190° (VIEW INTO CORRIDOR)
1 Threshold	J32300 x 57 MM WIDTH (2-1/4 INCHES)
1 Auto Door Bottom	R0Y346 – HEAVY DUTY
2 Sets Self-Adhesive Seals	R0Y154

OMIT VIEWER IF DOOR PROVIDED WITH VISION LITE.

OMIT COAT HOOK WHERE GLASS LITE PREVENTS INSTALLATION.

HW-4B

Each Door to Have:

NON-RATED/RATED

- 1 Continuous Hinge
- 1 Public Restroom Lock F09
- 1 Closer C02011/C02021
- 1 Closer CO2051/CO2061
- 1 Kick Plate J102
- 1 Mop Plate (@ Inswing Doors) J103
- 1 Floor Stop (@ Outswing Doors) L02121 x 3 FASTENERS
- 1 Wall Stop (@ Inswing Doors) L02101 CONVEX
- 1 Threshold J32300 x 57 MM WIDTH (2-1/4 INCHES)
- 1 Auto Door Bottom R0Y346 – HEAVY DUTY
- 2 Sets Self-Adhesive Seals R0Y154

PROVIDE NON-HOLD-OPEN CLOSER AT TOILET ROOMS.

STONE THRESHOLD BY OTHER TRADES.

HW-4F

Each Door to Have:

RATED

- 1 Continuous Hinge x INTEGRAL HINGE GUARD CHANNEL
X ADJUSTA-SCREWS
- 1 Utility Lock F09
- 1 Closer C02011/C02021
- 1 Armor Plate J101 x 1.275 MM (0.050 INCH) THICKNESS
- 1 Edge Guard (@ Wood Doors) J208M / J211 (VERIFY), CUT: HARDWARE
- 1 Floor Stop (@ Outswing Doors) L02121 x 3 FASTENERS
- 1 Wall Stop (@ Inswing Doors) L02101 CONVEX
- 1 Set Self-Adhesive Seals R0Y154

HW-5B

Each Door to Have:

RATED

- | | | |
|---|--|--|
| 1 | Continuous Hinge | x INTEGRAL HINGE GUARD CHANNEL
X ADJUSTA-SCREWS |
| 1 | Storeroom Lock | F07 |
| 1 | Closer | C02011/C02021 |
| 1 | Armor Plate | J101 x 1.275 MM (0.050 INCH) THICKNESS |
| 1 | Edge Guard (@ Wood Doors) J208M / J211 (VERIFY), CUT: HARDWARE | |
| 1 | Floor Stop | L02121 x 3 FASTENERS |
| 1 | Set Self-Adhesive Seals | ROY154 |

HW-5D

Each Door to Have:

NON-RATED

- | | Hinges | QUANTITY & TYPE AS REQUIRED |
|---|------------------------------|---|
| 1 | Storeroom Lock | F07 |
| 1 | Kick Plate | J102 (@ STORAGE, EVM, & HAC ROOMS ONLY) |
| 1 | Floor Stop (@ Inswing Doors) | L02121 x 3 FASTENERS |
| 1 | Wall Stop (@ Outswing Doors) | L02101 CONVEX |
| 3 | Silencers | L03011 |

HW-5G

Each Door to Have:

NON-RATED

Hinges	QUANTITY & TYPE AS REQUIRED
1 Storeroom Lock	F07
1 Kick Plate	J102
1 Floor Stop	L02121 x 3 FASTENERS
1 Threshold	J32300 x 57 MM WIDTH (2-1/4 INCHES)
1 Auto Door Bottom	R0Y346 – HEAVY DUTY
2 Sets Self-Adhesive Seals	R0Y154

HW-6D

Each Door to Have:

RATED

1 Key Cylinder	TYPE AS REQUIRED
----------------	------------------

BALANCE OF HARDWARE BY SECTION 08 17 10, INTEGRATED DOOR ASSEMBLIES

HW-11

Each Pair to Have:	RATED/NR
Hinges	QUANTITY & TYPE AS REQUIRED
1 Set Auto Flush Bolts	TYPE 25 LESS BOTTOM BOLT
1 Storeroom Lock	F07
1 Coordinator	TYPE 21A
1 Overlapping Astragal with Self-Adhesive Seal	R0Y634 x R0Y154 x THRU-BOLTS
2 Closers	C02011/C02021
2 Kick Plates	J102 (@ STORAGE ROOMS ONLY)
2 Floor Stops	L02121 x 3 FASTENERS
1 Set Self-Adhesive Seals	R0Y154

INTERIOR PAIRS OF DOORS

HW-8D

Each [ADO] Aluminum Storefront Pair to Have: NON-RATED

2	Pivot Sets	C07162
2	Intermediate Transfer Pivots	C07321 x 4-WIRES
2	Intermediate Pivots	C07321
2	Push/Pull Bar Sets	J505 – 305 MM (12 INCH) CENTER-TO-CENTER PULL
2	Overhead Stops	C01541-ADJUSTABLE

AUTO DOOR OPERATORS, CONTROLS, AND REACTIVATION SENSORS BY SECTION 08 71
13.11.

POWER TRANSFERS FOR RE-ACTIVATION SENSOR WIRING (RE-ACTIVATION SENSORS
PROVIDED BY SECTION 08 71 13).

120VAC POWER, CONDUIT, AND WIRING BY DIVISION 26.

HW-SDH1

All hardware by door and frame manufacturer, see 08 14 73 for Basis of Design product

HW-13

Each [ADO] Bi-Parting Automatic Pair to Have:

NON-RATED

ALL HARDWARE BY SECTION 08 71 13.

SECURITY HARDWARE ABBREVIATIONS LEGEND:

AC = Access Control Device (Card reader, biometric reader, keypad, etc.)
ADO = Automatic Door Operator
DEML = Delayed Egress Magnetic Lock
DEPH = Delayed Egress Panic Exit Device
DPS = Door Position Switch (Door or Alarm Contact)
EL = Electric Lock or Electric Lever Exit Device
PB = Push-button Combination Lock (stand-alone)
RR = Remote Release Button
ELR = Electric Latch Retraction Exit Device
REX = Request-to-Exit Switch in Latching Device Inside Trim

INTERIOR SINGLE SECURITY DOORS

HW-SH-3C

Each [PB] Door to Have:

NON-RATED/RATED

- | | |
|--|--|
| 1 Continuous Hinge | x INTEGRAL HINGE GUARD CHANNEL
X ADJUSTA-SCREWS |
| 1 Mortise Lock | |
| 1 Closer | C02011/C02021 |
| 1 Armor Plate | J101 x 1.275 MM (0.050 INCH) THICKNESS |
| 1 Edge Guard (@ Wood Doors) J208M / J211 (VERIFY), CUT: HARDWARE | |
| 1 Floor Stop | L02121 x 3 FASTENERS |
| 1 Set Self-Adhesive Seals | ROY154 |

HW-SH-4

Each [AC, EL, REX, DPS] Integrated Door to Have:

RATED

1 Key Cylinder

TYPE AS REQUIRED

BALANCE OF HARDWARE BY SECTION 08 17 10, INTEGRATED DOOR ASSEMBLIES

HW-SH-4A

Each [ADO, AC, ELR, REX, DPS] Integrated Door to Have:

RATED

1 Key Cylinder

TYPE AS REQUIRED

BALANCE OF HARDWARE BY SECTION 08 17 10, INTEGRATED DOOR ASSEMBLIES

--- E N D ---

SECTION 08 71 13
AUTOMATIC DOOR OPERATORS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Automatic operators for swinging and sliding doors.

1.2 RELATED REQUIREMENTS

- A. Aluminum Frames Entrance Work: Section 08 41 13, ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS.
- B. Revolving Door Operators: Section 08 04 33, REVOLVING DOOR ENTRANCES.
- C. Door Hardware: Section 08 71 00, DOOR HARDWARE.
- D. Access Control Devices: Division 28, ELECTRONIC SAFETY AND SECURITY.
- E. Electric General Wiring, Connections and Equipment Requirements: Division 26, ELECTRICAL.

1.3 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. ASTM International (ASTM):
 - 1. B209-14 - Aluminum and Aluminum-Alloy Sheet and Plate.
 - 2. A1008/A1008M-15 - Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Baked Hardenable.
- C. Builders Hardware Manufacturers Association (BHMA):
 - 1. BHMA A156.10-11 - Power Operated Pedestrian Doors.
- D. National Fire Protection Association (NFPA):
 - 1. 101-15 - Life Safety Code.
- E. Underwriters Laboratories (UL):
 - 1. 325-13 - Standard for Doors, Drapery, Gate, Louver, and Window Operators and Systems.

1.4 SUBMITTALS

- A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Submittal Drawings:
 - 1. Show size, configuration, and fabrication and installation details.
- C. Manufacturer's Literature and Data:
 - 1. Description of each product.
 - 2. Installation instructions.
 - 3. Warranty.
- D. Sustainable Construction Submittals:
 - 1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.
- E. Test reports: Certify each product complies with specifications.
- F. Qualifications: Substantiate qualifications comply with specifications.
 - 1. Manufacturer
 - 2. Installer
- G. Operation and Maintenance Data:
 - 1. Care instructions for each exposed finish product.
 - 2. Start-up, maintenance, troubleshooting, emergency, and shut-down instructions for each operational product.

1.5 QUALITY ASSURANCE

- A. Manufacturer's Qualifications:
 - 1. Regularly manufactures specified products.
 - 2. Manufactured specified products with satisfactory service on five similar installations for minimum five years.
 - a. Provide contact names and addresses for completed projects when requested by Contracting Officer's Representative.
- B. Installer's Qualifications: Experienced installer, approved by the manufacturer.

1.6 WARRANTY

- A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."
- B. Manufacturer's Warranty: Warrant automatic door operators against material and manufacturing defects.
 - 1. Warranty Period: Two years.

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

- A. Comply with requirements of BHMA A156.10. Unless otherwise indicated on Drawings, provide operators that move doors from fully closed to fully opened position in five seconds maximum time interval, when speed adjustment is at maximum setting.
- B. Equipment: Conforming to UL 325. Provide key operated power disconnect wall switch for each door installation.
- C. Electrical Wiring, Connections and Equipment: Motors, starters, controls, associated devices, and interconnecting wiring required for installation. Equipment and wiring as specified in Division 26, ELECTRICAL.

2.2 PRODUCTS - GENERAL

- A. Basis of Design: Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Provide door operators from one manufacturer.
- C. Provide one type of operator throughout project.
- D. Sustainable Construction Requirements:
 - 1. Steel Recycled Content: 30 percent total recycled content, minimum.
 - 2. Aluminum Recycled Content: 80 percent total recycled content, minimum.

2.3 SWING DOOR OPERATORS

- A. General:
 - 1. Type: Institutional type.
 - 2. Size: As recommended by manufacturer for door weight and sizes.
- B. Function:

1. Provide operators, enclosed in housing, permitting opening of door by energizing motor and stopped by electrically reducing Voltage and stalling motor against mechanical stop.
 2. Door to close by means of spring energy, and closing force controlled by gear system and motor being used as dynamic brake without power, or controlled by hydraulic closer in electro-hydraulic operators.
 3. Opening and Closing Speeds: Field adjustable.
 4. Operators with checking mechanism providing cushioning action at last part of door travel, in both opening and closing cycle.
 5. Operators capable of recycling doors instantaneously to full open position from any point in closing cycle when control switch is activated.
 6. When automatic power is interrupted or shut-off, permit doors to easily open manually without damage to automatic operator system.
- C. Connect hardware with drive arm attached to door with pin linkage rotating in a self-lubricating bearing. Prevent doors from pivoting on shaft of operator.
- D. Operator Housing:
1. ASTM B209, Type 6063-T5 aluminum alloy, 4-1/2 inches wide by 5.5 inches high by 0.125 inch thick, aluminum extrusions with enclosed end caps for application to 4 inches and larger frame systems.
- E. Power Operator:
1. Completely assembled and sealed unit including gear drive transmission, mechanical spring and bearings, located in aluminum case and filled with special lubricant for extreme temperature conditions. Rubber mounted units with provisions for easy maintenance and replacement, without removing door from pivots or frame.
- F. Motors:
1. Provide with interlock to prevent operation when doors are electrically locked from opening.
- G. Electrical Control:

1. Self-contained electrical control unit, including necessary transformers, relays, rectifiers, and other electronic components for proper operation and switching of power operator.
 2. Connecting Harnesses: Interlocking plugs.
- H. Accessories:
1. Metal mounting supports, brackets and other accessories necessary for installation of operators at head of door frames.
- I. Microprocessor Controls:
1. Multi-function microprocessor control providing adjustable hold open time (1-30 seconds) with fully adjustable opening speed, LED indications for sensor input signals and operator status and power assist close options. Control capable of receiving activation signals from any device with normally open dry contact output.
 2. Hold doors held open by low Voltage applied to the continuous duty motor.
 3. Controls:
 - a. Adjustable safety circuit that monitors door operation and stops opening direction of door if obstruction is sensed.
 - b. Recycle feature that reopens door if obstruction is sensed at any point during closing cycle.
 - c. Standard three position key switch with functions for ON, OFF, and HOLD OPEN, mounted on operator enclosure, door frame, or wall, as indicated on drawings.

2.4 SLIDING DOOR OPERATORS

- A. Operator Function:
1. Electric motor pulling door from closed to open position, stopping door by electrically reducing Voltage and stalling door against mechanical stop.
 2. Opening and Closing Speeds: Field adjustable.
 3. System permitting manual control of door in event of power failure.
- B. Power Operator:

1. Completely assembled and sealed electromechanical operating unit including 95 W (1/8 hp.) DC shunt-wound permanent magnet motor with sealed bearings, located in aluminum case and filled with special lubricant for extreme temperature conditions. Rubber mount units with provisions for easy maintenance and replacement, without removing door from pivots or frame.
 2. Opening and Closing Cycle: Field adjustable.
- C. Operator Housing:
1. ASTM B209, Type 6063-T5 aluminum alloy, 6 inches wide by 8 inches high by 0.125 inch thick, aluminum extrusions with enclosed end caps for application to 4 inches and larger frame systems.

2.5 SLIDING DOOR UNITS

- A. Provide door panels in compliance with NFPA 101, allowing "breakout" to full open position to provide instant egress at any point in door's movement.
1. Door Panels: ASTM A1008/A1008M, steel sheet, Type B, cold-rolled, reinforce frame structure, minimum 0.043 inch thick steel shapes.
- B. Sliding Door Hardware Guide Rollers, Door Carrier:
1. Rollers: Steel or plastic rollers with sealed bearings with each door having two support rollers and one anti-rise roller.
 - a. Vertical Adjustment: Minimum 0.35 inch with positive mechanical locks.
 - b. Include two urethane covered oil impregnated bearing bottom rollers attached with 3/16 inch thick formed steel guide brackets at each door.
 - c. Door Carriers: For each door carrier supporting door leaf, include vertical steel reinforcing member to prevent sagging when door is swung under breakaway conditions.
 - 1) Carbon Steel Brackets And Fittings: Corrosion resistant.
- C. Locking Hardware:
1. Locking hardware at interior doors not requiring physical security is not required.
 2. Doors with flush concealed vertical rod panic hardware integrated into doors where physical security is required and free egress is required at all times.

3. Doors with manufacturers' standard hookbolt lock (keyed both sides) where physical security is required and free egress is not required at all times.
 - a. At doors with access control devices specified in Division 28 - ELECTRONIC SAFETY AND SECURITY, provide doors with electronic deadbolt locking to prevent doors from manually sliding open.
- D. Door Closers: Breakout or swing-out panels with door closers concealed in top rail of door.

2.6 POWER UNITS

- A. Self-contained, electric operated and independent of door operator.
 1. Capacity and size of power circuits according to automatic door operator manufacturer's specifications and Division 26 - ELECTRICAL.

2.7 DOOR CONTROLS

- A. Control Devices: BHMA A156.10; control opening and closing functions.
- B. Open doors when control device is actuated; hold doors in open positions; then, close doors after a adjustable time period, unless safety device or reactivated control interrupts operation.
- C. Manual Controls:
 1. Push Plate Wall Switch: Recessed type, stainless steel push plate minimum 4 inch by 4 inch, with 1/2 inch high letters "To Operate Door-Push" engraved on face of plate.
- D. Motion Detector:
 1. Mounting: Surface or concealed.
 2. Detection Area: 60 inches deep and 60 inches across, plus or minus 6 inches.
 3. Response Time: 25 milliseconds, maximum.
 4. Control Power: 24 Volt DC.
 5. Design units to be unaffected by cleaning material, solvents, dust, dirt and outdoor weather conditions.

2.8 SAFETY DEVICES

- A. Sliding Doors:

1. Two photoelectric beams mounted at heights of 24 inches and 48 inches in door frame.
 2. Overhead safety presence sensors at door head on both sides of opening.
 3. Recycle doors to full open position when beams are interrupted.
 4. Motion detector mounted on both sides of door for detection of traffic in both direction.
- B. Swing Doors: Install presence sensor on pull side of door to detect any person standing in door swing path and prevent door from opening.
1. Time delay Switches: Adjustable between 3 to 60 seconds and control closing cycle of doors.
- C. Install decal signs with "In" or "Do Not Enter" on both faces of each door where shown.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine and verify substrate suitability for product installation.
1. Verify door opening is correctly sized and within acceptable tolerances.
- B. Protect existing construction and completed work from damage.

3.2 INSTALLATION

- A. Install products according to manufacturer's instructions and approved submittal drawings.
1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.
- B. Coordinate door installation with other related work.
- C. Install manual controls and power disconnect switches recessed or semi-flush mounted in partitions.
- D. Secure operator components to adjacent construction with suitable fastenings.
- E. Conceal conduits, piping, and electric equipment, in finish work.
- F. Install power units in locations shown.
1. Where units are mounted on walls, provide metal supports or shelves for units.

2. Ensure equipment, including time delay switches, are accessible for maintenance and adjustment.
- G. Ensure operators are adjusted and function properly for type of expected traffic.
- H. Synchronize each leaf of pair doors to open and close simultaneously. Permit each door leaf to be opened manually, independent of other door leaf.
- I. Install controls at positions shown and ensuring convenience for expected traffic.
- J. Push Plate Wall Switches Mounting Height: 40 inches maximum, unless otherwise approved by Contracting Officer's Representative.

3.3 DEMONSTRATION AND TRAINING

- A. Instruct VA personnel in proper automatic door operator operation and maintenance.
 1. Trainer: Manufacturer approved instructor.
 2. Training Time: 2 hours minimum.
- B. Coordinate instruction to VA personnel with VA Contracting Officer's Representative.

-- E N D --

SECTION 08 71 13.11
LOW ENERGY POWER ASSIST DOOR OPERATORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Low-energy, power-assisted automatic swing door operators.

1.2 RELATED REQUIREMENTS

- A. Commissioning; Section 01 91 00, GENERAL COMMISSIONING REQUIREMENTS.
- B. Steel Doors; Section 08 11 13, HOLLOW METAL DOORS AND FRAMES.
- C. Wood Doors; Section 08 14 00, INTERIOR WOOD DOORS.
- D. Aluminum Frames Entrance Work; Section 08 41 13, ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS.
- E. Door Hardware; Section 08 71 00, DOOR HARDWARE.
- F. Finish Color, Section 09 06 00, SCHEDULE FOR FINISHES.
- G. Electric General Wiring, Connections and Equipment Requirements; Division 26, ELECTRICAL.

1.3 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. ASTM International (ASTM):
 1. B209-14 - Aluminum and Aluminum-Alloy Sheet and Plate.
 2. B221-14 - Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- C. Builders Hardware Manufacturers Association, Inc. (BHMA):
 1. 156.19-07 - Power Assist and Low Energy Power Operated Doors.

1.4 PREINSTALLATION MEETINGS

- A. Conduct preinstallation meeting minimum 30 days before beginning Work of this section.
 1. Required Participants:

- a. Contracting Officer's Representative.
- b. Architect/Engineer.
- c. Contractor.
- d. Installer.
- e. Other installers responsible for adjacent and intersecting work, including electrical wiring installers.

1.5 SUBMITTALS

- A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Submittal Drawings:
 - 1. Show size, configuration, and fabrication and installation details.
- C. Manufacturer's Literature and Data:
 - 1. Description of each product.
 - 2. Maintenance manuals.
 - 3. Installation instructions.
 - 4. Warranty.
- D. Samples:
 - 1. Door Operator: Full sized, complete assembly.
 - 2. Approved samples may be incorporated into work.
- E. Certificates: Certify each product complies with specifications.
 - 1. Show door operator is UL Listed for specified application.
- F. Operation and Maintenance Data:
 - 1. Care instructions for each exposed finish product.
 - 2. Start-up, maintenance, troubleshooting, emergency, and shut-down instructions for each operational product.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 - 1. Regularly manufactures specified products.

B. Installer Qualifications:

1. Regularly installs specified products.

1.7 DELIVERY

- A. Deliver products in manufacturer's original sealed packaging.
- B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, production run number, and manufacture date.
- C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.8 STORAGE AND HANDLING

- A. Store products indoors in dry, weathertight facility.
- B. Protect products from damage during handling and construction operations.

1.9 WARRANTY

- A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."
- B. Manufacturer's Warranty: Warrant automatic door operators against material and manufacturing defects.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Power assisted automatic door equipment accommodating normal traffic as well as the weight of the doors; UL approved and comply with applicable codes.

2.2 SYSTEM PERFORMANCE

- A. Opening Force: Maximum 67 N (15 lbf.).
- B. Cycle Tests: 300,000 cycles.
 1. Use the widest and heaviest door specified as a test specimen. Narrower or lighter doors of the same configurations will be considered to meet the cycle test requirements.

2.3 MATERIALS

- A. Aluminum:

1. Sheet: ASTM B209.
2. Extrusions: ASTM B221.

2.4 PRODUCTS - GENERAL

- A. Provide automatic door operators from one manufacturer.

2.5 LOW-ENERGY AUTOMATIC DOOR OPERATORS

- A. Conform to BHMA A156.19.
- B. Mounting: Surface-mounted
- C. Enclosure: Self-contained within an extruded aluminum housing (alloy 6063-T6) to conceal operator mechanism and mounting brackets and with removable access cover with an overall maximum size of 140 mm (5-1/2 inches) wide by 150 mm (6 inches) deep.
- D. Safety Features:
 1. Adjustable time delay.
 2. Adjustable speed for opening and closing operations.
 3. Adjustable backcheck.
 4. Decals indicating "In" or "Do Not Enter" installed on both faces of each door where shown conforming to the requirements of ANSI/BHMA A156.19.
 5. Re-activation sensor mounted on the push-side door face near the top detect any person standing in the door swing path and prevent the door from closing.
 6. Motion sensor to detect any person standing in the door swing path and prevent the door from opening.
 - a. Adjustable door sensor system providing complete operation and safety zone coverage.
- E. Power Units:
 1. Self-contained electric circuits for automatic operators located on each floor of the building.

2. Interruption or failure of power circuits for operators located on one floor of the building shall not interfere with continuous performance of automatic operated doors located on other floors.
3. Power units designed to not interfere with continuous performance of automatic operated doors located on other floors in the case of power interruption or failure.
4. Capacity and size of power circuits according to automatic operator manufacturer's specifications.

2.6 OPERATION

- A. Traffic Operation:
 1. Single Door: Two way.
 2. Double Doors: Double swing.
- B. Operator: Electromechanical; surface-mounted.
 1. Operators to have checking mechanism providing cushioning action at last part of door travel, in both opening and closing cycle.
 2. Operators to recycle doors instantaneously to full open position from any point in closing cycle when control switch is reactivated.
 3. Operators to allow manual door control in event of power failure.
- C. Controls: Solid-state type.
- D. Activation: Push-plate switch.

2.7 FINISHES

- A. Aluminum Anodized Finish: NAAMM AMP 500.
 1. Clear Anodized Finish: AA-C22A41; Class I Architectural, 0.018 mm (0.7 mil) thick.
 2. Color Anodized Finish: AA-C22A42 or AA-C22A44; Class I Architectural, 0.018 mm (0.7 mil) thick.
 3. Clear Anodized Finish: AA-C22A31; Class II Architectural, 0.01 mm (0.4 mil) thick.
 4. Color Anodized Finish: AA-C22A32 or AA-C22A34; Class II Architectural, 0.01 mm (0.4 mil) thick.
- B. Aluminum Paint finish:

1. Baked-Enamel or Powder-Coat: AAMA 2603; dry film thickness of 0.04 mm (1.5 mils).

2.8 ACCESSORIES

- A. Signage: BHMA standard for operation and door type specified.
- B. Guide Rails: Aluminum bar baked-enamel or powder-coat finish.
- C. Fasteners: Corrosion-resistant, compatible with adjoining materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions effecting work, including door and frame preparation and electrical rough-ins.

3.2 INSTALLATION - GENERAL

- A. Install products according to manufacturer's instructions and approved submittal drawings.
 1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.
- B. Coordinate installation of equipment with other related work.
- C. Mount manual controls and power disconnect switches recessed or semi-flush in partitions.
- D. Secure operator components to adjacent construction with suitable fastenings. Conceal conduits, piping, and electric equipment in finish work.
- E. Install power units and controls in locations indicated.
 1. Where units are to be mounted on walls, provide metal supports or shelves for the units.

3.3 ADJUSTING

- A. All equipment, including time delay switches, to be accessible for maintenance and adjustment.

- B. Adjust operators to function properly for the type of traffic (pedestrians) expected to pass through doors.
- C. Adjust each door leaf of pairs of doors to open and close in synchronization.
- D. On pairs of doors, adjust operators allowing either door to be opened manually without the other door opening.

3.4 DEMONSTRATION AND TRAINING

- A. Instruct VA personnel in proper door operator operation and maintenance.
 - 1. Trainer: Manufacturer approved instructor.
- B. Submit training plan and trainer qualifications. See Section 01 91 00 - GENERAL COMMISSIONING REQUIREMENTS.
- C. Acceptance Condition: After completing work, operate door operators 15 consecutive calendar days without breakdown.

--- E N D ---

**SECTION 08 80 00
GLAZING**

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies the following:

1. Glass.
2. Plastic glazing.
3. Switchable privacy glass and control system.
4. Glazing materials and accessories for both factory and field glazed assemblies.

1.2 RELATED WORK

- A. Section 01 81 13, SUSTAINABLE DESIGN REQUIREMENTS: Sustainable Design Requirements.
- B. Section 08 11 13, HOLLOW METAL DOORS AND FRAMES, and Section 08 14 00, WOOD DOORS: Sound resistant doors.
- C. Section 08 42 33, REVOLVING DOOR ENTRANCES: Revolving doors.
- D. Section 08 56 53, SECURITY WINDOWS: Forced Entry (FE) resistant and Ballistic Resistance (BR) rated glazing and frames.
- E. Section 10 28 00, TOILET, BATH, AND LAUNDRY ACCESSORIES: Mirrors.
- F. Section 08 56 59, SERVICE AND TELLER WINDOW UNITS Section 08 56 59, SERVICE AND TELLER WINDOW UNITS: Bullet resisting glass.
- G. Section 13 49 00, RADIATION PROTECTION: Lead glass.
- H. Section 08 51 13, ALUMINUM WINDOWS: Aluminum Windows.
- I. Section 08 51 13.11, SIDE HINGED ALUMINUM WINDOWS: Operable Windows (Double Glazed).
- J. Section 08 44 13, GLAZED ALUMINUM CURTAIN WALLS Glazed Curtain Walls: Glazed Curtain Walls.
- K. Security Windows: Section 08 56 53, SECURITY WINDOWS.
- L. Section 08 56 59, SERVICE AND TELLER WINDOW UNITS: Service and Teller Windows.
- M. Section 08 63 00, METAL-FRAMED SKYLIGHTS.

- N. Section 09 06 00, SCHEDULE FOR FINISHES: Color of spandrel glass, tinted (heat absorbing or light reducing) glass, and reflective (metallic coated) glass.
- O. Section 08 34 53, SECURITY DOORS AND FRAMES: Forced Entry (FE) resistant and Ballistic Resistance (BR) rated doors and frames.
- P. Section 26 05 19, LOW VOLTAGE ELECTRICAL POWER AND CONDUCTORS AND CABLES: Wiring (120 V AC, 15A or 20A).
- Q. Intrusion Detection: Section 28 16 11, INTRUSION DETECTION SYSTEM.
- R. Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS: Junction and Switch Boxes.
- S. Section 28 13 11, PHYSICAL ACCESS CONTROL SYSTEMS: Access Control Systems.

1.3 LABELS

A. Temporary labels:

- 1. Provide temporary label on each light of glass and plastic material identifying manufacturer or brand and glass type, quality and nominal thickness.
- 2. Label in accordance with NFRC label requirements.
- 3. Temporary labels are to remain intact until glass and plastic material is approved by Contracting Officer Representative (COR).

B. Permanent labels:

- 1. Locate in corner for each pane.
- 2. Label in accordance with ANSI Z97.1 and SGCC label requirements.
 - a. Tempered glass.
 - b. Laminated glass or have certificate for panes without permanent label.
 - c. Organic coated glass.
- 3. Bullet resistance glass or plastic assemblies:
 - a. Bullet resistance glass or plastic assemblies in accordance with UL 752 requirements for power rating specified.
 - b. Identify each security glazing permanently with glazing manufacturer's name, date of manufacture, product number, and DOS Code number inconspicuously located in lower corner on protective side and visible after glazing is framed.

- c. The "attack (threat) side" is to be identified in bold lettering on each side of glazing with removable label.
- 4. Fire rated glazing assemblies: Mark in accordance with IBC.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Design glazing system consistent with guidance and practices presented in the GANA Glazing Manual, GANA Laminated Glazing Manual, and GANA Sealant Manual, as applicable to project. Installed glazing is to withstand applied loads, thermal stresses, thermal movements, building movements, permitted tolerances, and combinations of these conditions without failure, including loss or glass breakage attributable to defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; unsafe engagement of the framing system; deflections beyond specified limits; or other defects in construction.
- B. Glazing Unit Design: Design glass, including engineering analysis meeting requirements of authorities having jurisdiction. Thicknesses listed are minimum. Coordinate thicknesses with framing system manufacturers.
 - 1. Design glass in accordance with ASTM E1300, and for conditions beyond the scope of ASTM E1300, by a properly substantiated structural analysis.
 - 2. Design Wind Pressures: In accordance with ASCE 7
 - 3. Wind Design Data: In accordance with ASCE 7
 - 4. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than the structural capacity of the glazing unit, the threshold at which frame engagement is no longer safely assured, 1/100 times the short-side length, or 19 mm (0.75 inch), whichever is less.
- C. Ballistic- and Blast- resistant glass or plastic glazing assemblies:
 - 1. For blast-resistant and ballistic-resistant units comply with requirements in Physical Security Design Manual for VA Life Safety Protected Facilities, and project-specific criteria provided on the drawings and specifications.
 - 2. Spall Resistance: Laminated glazing is not permitted to produce spall to interior (protected side) when impacted with scheduled ballistics.

3. Tolerances:
 - a. Outside dimensions: Overall outside dimensions (height and width) of laminated security glazing is to maintain tolerance of ± 3 mm (± 0.12 inch).
 - b. Warpage: Out-of-flat (warpage or bowing) condition of laminates is not to exceed 2.5 mm per lineal meter (0.10 inch per 3.3 lineal foot). The condition, if present, is to be localized to extent not greater than 0.75 mm (0.03 inch) for any 0.3 meter (0.98 feet) section.
- D. Windborne-Debris-Impact Resistance: Comply with enhanced-protection testing requirements in ASTM E1996 for project wind zone when tested according to ASTM E1886, based upon testing of specimens not less than the size required for project and utilizing installation method identical to that specified for project.
 1. Project Wind Zone: Wind Zone 1
 2. Large-Missile Test: For glazing located within 9.1 m (30 feet) of grade.
 3. Small-Missile Test: For glazing located more than 9.1 m (30 feet) above grade.
- E. Building Enclosure Vapor Retarder and Air Barrier:
 1. Utilize the inner pane of multiple pane sealed units for the continuity of the air barrier and vapor retarder seal.
 2. Maintain a continuous air barrier and vapor retarder throughout the glazed assembly from glass pane to heel bead of glazing sealant.

1.5 SUBMITTALS

- A. In accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Sustainable Design Submittals, as described below:
 1. Volatile organic compounds per volume as specified in PART 2 - PRODUCTS
- C. Manufacturer's Certificates:
 1. Certificate stating that fire-protection and fire-resistive glazing units meet code requirements for fire-resistance-rated assembly and applicable safety glazing requirements.
 2. Certificate on solar heat gain coefficient when value is specified.
 3. Certificate on "R" value when value is specified.

4. Certificate test reports confirming compliance with specified bullet resistive rating.
 5. Certificate that blast resistant glass meets the specified requirements.
- D. Manufacturer Warranty.
- E. Manufacturer's Literature and Data:
1. Glass, each kind required.
 2. Insulating glass units.
 3. Transparent (one-way vision glass) mirrors.
 4. Elastic compound for metal sash glazing.
 5. Putty, for wood sash glazing.
 6. Glazing cushion.
 7. Sealing compound.
 8. Bullet resistive material.
 9. Plastic glazing material, each type required.
- F. Samples:
1. Size: 305 mm by 305 mm (12 inches by 12 inches).
 2. Tinted glass.
 3. Reflective glass.
 4. Transparent (one-way vision glass) mirrors.
- G. Preconstruction Adhesion and Compatibility Test Report: Submit glazing sealant manufacturer's test report indicating glazing sealants were tested for adhesion to glass and glazing channel substrates and for compatibility with glass and other glazing materials.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Delivery: Schedule delivery to coincide with glazing schedules so minimum handling of crates is required. Do not open crates except as required for inspection for shipping damage.
- B. Storage: Store cases according to printed instructions on case, in areas least subject to traffic or falling objects. Keep storage area clean and dry.

- C. Handling: Unpack cases following printed instructions on case. Stack individual windows on edge leaned slightly against upright supports with separators between each.
- D. Protect laminated security glazing units against face and edge damage during entire sequence of fabrication, handling, and delivery to installation location. Provide protective covering on exposed faces of glazing plastics, and mark inside as "INTERIOR FACE" or "PROTECTED FACE":
1. Treat security glazing as fragile merchandise, and packaged and shipped in export wood cases with width end in upright position and blocked together in a mass. Storage and handling to comply with manufacturer's directions and as required to prevent edge damage or other damage to glazing resulting from effects of moisture, condensation, temperature changes, direct exposure to sun, other environmental conditions, and contact with chemical solvents.
 2. Protect sealed-air-space insulating glazing units from exposure to abnormal pressure changes, as could result from substantial changes in altitude during delivery by air freight. Provide temporary breather tubes which do not nullify applicable warranties on hermetic seals.
 3. Temporary protections: The glass front and polycarbonate back of glazing are to be temporarily protected with compatible, peelable, heat-resistant film which will be peeled for inspections and re-applied and finally removed after doors and windows are installed at destination. Since many adhesives will attack polycarbonate, the film used on exposed polycarbonate surfaces is to be approved and applied by manufacturer.
 4. Edge protection: To cushion and protect glass clad, and polycarbonate edges from contamination or foreign matter, the four (4) edges are to be sealed the depth of glazing with continuous standard-thickness thermoplastic rubber tape. Alternatively, continuous channel shaped extrusion of thermoplastic rubber are to be used, with flanges extending into face sides of glazing.
 5. Protect "Constant Temperature" units including every unit where glass sheet is directly laminated to or directly sealed with metal-tube type spacer bar to

polycarbonate sheet, from exposures to ambient temperatures outside the range of 16 to 24 degrees C (60 to 75 degrees F), during the fabricating, handling, shipping, storing, installation, and subsequent protection of glazing.

1.7 PROJECT CONDITIONS:

- A. Field Measurements: Field measure openings before ordering tempered glass products to assure for proper fit of field measured products.

1.8 WARRANTY

- A. Construction Warranty: Comply with the FAR clause 52.246-21 "Warranty of Construction".
- B. Manufacturer Warranty: Manufacturer shall warranty their glazing from the date of installation and final acceptance by the Government as follows. Submit manufacturer warranty.
1. Bullet resistive plastic material to remain visibly clear without discoloration for 10 years.
 2. Insulating glass units to remain sealed for ten (10) years.
 3. Laminated glass units to remain laminated for five (5) years.
 4. Polycarbonate to remain clear and ultraviolet light stabilized for five (5) years.
 5. Insulating plastic to not have more than 6 percent decrease in light transmission and be ultraviolet light stabilized for ten (10) years.

1.9 APPLICABLE PUBLICATIONS:

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only.
- B. American Architectural Manufacturers Association (AAMA):
- 800Test Methods for Sealants
 - 810.1-77Expanded Cellular Glazing Tape
- C. American National Standards Institute (ANSI):
- Z97.1-14Safety Glazing Material Used in Building - Safety Performance Specifications and Methods of Test
- D. American Society of Civil Engineers (ASCE):

7-10Wind Load Provisions

E. ASTM International (ASTM):

C542-05(2017)Lock-Strip Gaskets

C716-06(2020)Installing Lock-Strip Gaskets and Infill Glazing Materials

C794-18Adhesion-in-Peel of Elastomeric Joint Sealants

C864-05(2019)Dense Elastomeric Compression Seal Gaskets, Setting
Blocks, and Spacers

C920-18Elastomeric Joint Sealants

C964-20Standard Guide for Lock-Strip Gasket Glazing

C1036-16Flat Glass

C1048-18Heat-Treated Flat Glass-Kind HS, Kind FT Coated and
Uncoated Glass.

C1172-19Laminated Architectural Flat Glass

C1349-17Standard Specification for Architectural Flat Glass Clad
Polycarbonate

C1376-15Pyrolytic and Vacuum Deposition Coatings on Flat Glass

D635-18Rate of Burning and/or Extent and Time of Burning of Self-
Supporting Plastic in a Horizontal Position

D4802-16Poly (Methyl Methacrylate) Acrylic Plastic Sheet

E84-20Surface Burning Characteristics of Building Materials

E119-20Standard Test Methods for Fire Test of Building
Construction and Material

E1300-16Load Resistance of Glass in Buildings

E1886-19Standard Test Method for Performance of Exterior
Windows, Curtain Walls, Doors, and Impact Protective
Systems Impacted by Missile(s) and Exposed to Cyclic
Pressure Differentials

- E1996-17Standard Specification for Performance of Exterior
Windows, Curtain Walls, Doors, and Impact Protective
Systems Impacted by Windborne Debris in Hurricanes
- E2141-14Test Methods for Assessing the Durability of Absorptive
Electrochromic Coatings on Sealed Insulating Glass Units
- E2190-19Insulating Glass Unit
- E2240-06Test Method for Assessing the Current-Voltage Cycling
Stability at 90 Degree C (194 Degree F) of Absorptive
Electrochromic Coatings on Sealed Insulating Glass Units
- E2241-06Test Method for Assessing the Current-Voltage Cycling
Stability at Room Temperature of Absorptive
Electrochromic Coatings on Sealed Insulating Glass Units
- E2354-10Assessing the Durability of Absorptive Electrochromic
Coatings within Sealed Insulating Glass Units
- E2355-10Test Method for Measuring the Visible Light Transmission
Uniformity of an Absorptive Electrochromic Coating on a
Glazing Surface
- F1233-08(2019).....Standard Test Method for Security Glazing Materials and
Systems
- F1642/F1642M-17Test Method for Glazing and Glazing Systems Subject to
Airblast Loadings
- F. Code of Federal Regulations (CFR):
- 16 CFR 1201-10Safety Standard for Architectural Glazing Materials
- G. Glass Association of North America (GANA):
- 2010 EditionGANA Glazing Manual
- 2008 EditionGANA Sealant Manual
- 2009 EditionGANA Laminated Glazing Reference Manual
- 2010 EditionGANA Protective Glazing Reference Manual
- H. International Code Council (ICC):

- IBCInternational Building Code
- I. Insulating Glass Certification Council (IGCC)
- J. Insulating Glass Manufacturer Alliance (IGMA):
 - TB-3001-13.....Guidelines for Sloped Glazing
 - TM-3000.....North American Glazing Guidelines for Sealed Insulating
Glass Units for Commercial and Residential Use
- K. Intertek Testing Services – Warnock Hersey (ITS-WHI)
- L. National Fire Protection Association (NFPA):
 - 80-16Fire Doors and Windows
 - 252-12Fire Tests of Door Assemblies
 - 257-12Standard on Fire Test for Window and Glass Block
Assemblies
- M. National Fenestration Rating Council (NFRC)
- N. Safety Glazing Certification Council (SGCC) 2012:
 - Certified Products Directory (Issued Semi-Annually).
- O. Underwriters Laboratories, Inc. (UL):
 - 9-08(R2009).....Fire Tests of Window Assemblies
 - 263-14Fire Tests of Building Construction and Materials
 - 752-11Bullet-Resisting Equipment.
- P. Department of Veterans Affairs:
- Q. Architectural Design Manual for VA Facilities (VASDM)
- S. Environmental Protection Agency (EPA):
 - 40 CFR 59(2014)National Volatile Organic Compound Emission Standards
for Consumer and Commercial Products

PART 2 - PRODUCT

2.1 GLASS

- A. Provide minimum thickness stated and as additionally required to meet performance requirements.

1. Provide minimum 6 mm (1/4 inch) thick glass units unless otherwise indicated.
- B. Obtain glass units from single source from single manufacturer for each glass type.
- C. Clear Glass:
 1. ASTM C1036, Type I, Class 1, Quality q3
- D. Ultra-clear-Low-Iron Float Glass:
 1. ASTM C1036, Type I, Class 1, Quality q3 and with visible light transmission of not less than 90 percent.

2.2 HEAT-TREATED GLASS

- A. Roller Wave Limits for Heat-Treated Glass: Orient all roller wave distortion parallel to bottom surface of glazing, and provide units complying with the following limitations:
 1. Measurement Parallel to Line: Maximum peak to valley 0.203 mm (0.008 inch).
 2. Measurement Perpendicular to Line: Maximum 0.0254 mm (0.001 inch).
 3. Bow/Warp: Maximum 50 percent of bow and warp allowed by ASTM C1048.
- B. Clear Tempered Glass:
 1. ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality q3.

2.3 COATED GLASS

- A. Transparent Mirror (One-Way-Vision Glass):
 1. ASTM C1036, Type I, Class 1, Quality q2 or Class 3, Quality q3; Grey Glass.
 2. Thickness, 6 mm (1/4 inch).
 3. Coated one face with a hard adherent reflective film of chromium or other coating of proven equivalent durability.
 4. Visible light transmittance; eight percent, plus or minus two percent.
 5. Visible reflectance; sixty percent, plus or minus five percent.
 6. Light ratio; mirror side 10 or more; observer side one or less.
 7. Assemble with coating covered and protected with a layer of clear glass not less than 3 mm (1/8 inch) thick.
 8. Clean interface glass prior to assembly.
 9. Tape edge to seal interface and hold panes together.

2.4 LAMINATED GLASS

- A. Laminated Glass: ASTM C1172. Two or more lites of heat treated glass bonded with polyvinyl butyral, ionomeric polymer, or cast-in-place and cured-transparent-resin interlayer complying with interlayer manufacturer's written instructions. Minimum total laminated thickness of 1/4" for blast resistant glazing.
- B. Interlayer: Use min. 0.75 mm (0.030 inch) thick interlayer for vertical glazing unless otherwise indicated in construction documents.
- C. Interlayer: Use 1.5 mm (0.060 inch) thick interlayer for:
 - 1. Horizontal or sloped glazing.
 - 2. Acoustical glazing.
 - 3. Assemblies requiring heat strengthened or fully tempered glass.
- D. Interlayer: Use 2.28 mm (0.090 inch) thick interlayer where required to meet performance requirements.
- E. Interlayer Color: Clear, unless otherwise indicated in construction documents.

2.5 INSULATING GLASS UNITS

- A. Provide factory fabricated, hermetically sealed glass unit consisting of two panes of glass separated by a dehydrated air space and comply with ASTM E2190. The exterior glass unit shall be fully tempered and the inner glass unit shall be laminated annealed at a minimum for all blast resistant glazing.
- B. Assemble units using glass types specified in Insulating Glass Schedule and Blast Glazing assembly requirements

2.6 FIRE PROTECTION AND FIRE RESISTANCE GLAZING

- A. Fire-Protection-Rated Glazing: Glazing units tested for use in fire door assemblies or fire windows, UL, ITS-WHI or equivalent listed and labeled by testing agency in accordance with IBC, for fire-protection ratings as indicated on construction documents, based upon positive-pressure testing per NFPA 257 or UL 9, and complying with NFPA 80.
 - 1. Hose-Stream Test: Units must comply, except units having fire-protection rating of 20 minutes.

2. Labeling: Permanently label fire-protection-rated glazing units in accordance with IBC.
 3. Safety Glazing: Comply with 16 CFR 1201, Category II.
 4. Fire-Protection-Rated Tempered Glass: For 20-minute fire-protection-rated door assemblies, of thickness scheduled.
 5. Fire-Protection-Rated Laminated Ceramic Glazing: Units made from two lites of clear, ceramic glass, 8 mm (5/16 inch) total thickness, for rating scheduled.
 6. Fire-Protection-Rated Laminated Glass with Intumescent Interlayers: Units made from multiple lites of uncoated, ultra-clear (low-iron) float glass, in intumescent interlayers, of thickness and rating scheduled.
- B. Fire-Resistance-Rated Glazing: Glazing units tested for use in fire wall assemblies, UL, ITS-WHI or equivalent listed and labeled by testing agency in accordance with IBC for fire-resistance ratings of wall assemblies as indicated on construction documents, based upon testing according to NFPA 252 and ASTM E119 or UL 263.
1. Labeling: Permanently label fire-resistance-rated glazing units in accordance with IBC.
 2. Safety Glazing: Comply with 16 CFR 1201, Category II.
 3. Fire-Resistance-Rated Laminated Glass with Intumescent Interlayers: Units made from multiple lites of uncoated, ultra-clear low-iron float glass, in intumescent interlayers, of thickness and rating scheduled.
 4. Fire-Resistance-Rated Double Glazing Units with Gel Fill: Units made from two lites of uncoated, fully tempered, ultra-clear (low-iron) float glass, with perimeter metal spacer and edge seal forming cavity filled with clear, fully transparent, heat-absorbing gel, of thickness and fire-protection rating scheduled.

2.7 GLAZING ACCESSORIES

- A. As required to supplement the accessories provided with the items to be glazed and to provide a complete installation. Ferrous metal accessories exposed in the finished work are to have a finish that will not corrode or stain while in service. Fire rated glazing to be

installed with glazing accessories in accordance with the manufacturer's installation instructions.

B. Setting Blocks: ASTM C864:

1. Silicone type.
2. Channel shape; having 6 mm (1/4 inch) internal depth.
3. Shore A hardness of 80 to 90 Durometer.
4. Block lengths: 50 mm (2 inches) except 100 to 150 mm (4 to 6 inches) for insulating glass.
5. Block width: Approximately 1.6 mm (1/16 inch) less than the full width of the rabbet.
6. Block thickness: Minimum 4.8 mm (3/16 inch). Thickness sized for rabbet depth as required.

C. Spacers: ASTM C864:

1. Channel shape having a 6 mm (1/4 inch) internal depth.
2. Flanges not less 2.4 mm (3/32 inch) thick and web 3 mm (1/8 inch) thick.
3. Lengths: 25 to 76 mm (1 to 3 inches).
4. Shore A hardness of 40 to 50 Durometer.

D. Glazing Tapes:

1. Semi-solid polymeric based closed cell material exhibiting pressure-sensitive adhesion and withstanding exposure to sunlight, moisture, heat, cold, and aging.
2. Shape, size and degree of softness and strength suitable for use in glazing application to prevent water infiltration.
3. Complying with AAMA 800 for the following types:
 - a. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
 - b. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

E. Spring Steel Spacer: Galvanized steel wire or strip designed to position glazing in channel or rabbeted sash with stops.

- F. Glazing Clips: Galvanized steel spring wire designed to hold glass in position in rabbeted sash without stops.
- G. Glazing Points (Sprigs): Pure zinc stock, thin, flat, triangular or diamond shaped pieces, 6 mm (1/4 inch) minimum size.
- H. Glazing Gaskets: ASTM C864:
 - 1. Firm dense wedge shape for locking in sash.
 - 2. Soft, closed cell with locking key for sash key.
 - 3. Flanges may terminate above the glazing-beads or terminate flush with top of beads.
- I. Lock-Strip Glazing Gaskets: ASTM C542, shape, size, and mounting as indicated.
- J. Glazing Sealants: ASTM C920, silicone neutral cure:
 - 1. Type S.
 - 2. Class 25 or 50 as recommended by manufacturer for application.
 - 3. Grade NS.
 - 4. Shore A hardness of 25 to 30 Durometer.
 - 5. VOC Content: For sealants used inside the weatherproofing system, not more than 250 g/L or less when calculating according to 40 CFR 59, (EPA Method 24)

Structural Sealant: ASTM C920, silicone acetoxo cure:

 - 6. Type S.
 - 7. Class 25.
 - 8. Grade NS.
 - 9. Shore a hardness of 25 to 30 Durometer.
- K. Neoprene, EPDM, or Vinyl Glazing Gasket: ASTM C864.
 - 1. Channel shape; flanges may terminate above the glazing channel or flush with the top of the channel.
 - 2. Designed for dry glazing.
- L. Color:
 - 1. Color of glazing compounds, gaskets, and sealants used for aluminum color frames to match color of the finished aluminum and be nonstaining.

2. Color of other glazing compounds, gaskets, and sealants which will be exposed in the finished work and unpainted are to be black, gray, or neutral color.

M. Smoke Removal Unit Targets: Adhesive targets affixed to glass to identify glass units intended for removal for smoke control. Comply with requirements of local Fire Department.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:

1. Examine openings for glass and glazing units; determine they are proper size; plumb; square; and level before installation is started.
2. Verify that glazing openings conform with details, dimensions and tolerances indicated on manufacturer is approved shop drawings.

B. Review for conditions which may adversely affect glass and glazing unit installation, prior to commencement of installation. Do not proceed with installation until unsatisfactory conditions have been corrected.

C. Verify that wash down of adjacent masonry is completed prior to erection of glass and glazing units.

3.2 PREPARATION

A. For sealant glazing, prepare glazing surfaces in accordance with GANA Sealant Manual.

B. Determine glazing unit size and edge clearances by measuring the actual unit to receive the glazing.

C. Shop fabricate and cut glass with smooth, straight edges of full size required by openings to provide GANA recommended edge clearances.

D. Verify that components used are compatible.

E. Clean and dry glazing surfaces.

F. Prime surfaces scheduled to receive sealants, as determined by preconstruction sealant-substrate testing.

3.3 INSTALLATION – GENERAL

- A. Install in accordance with GANA Glazing Manual, GANA Sealant Manual, IGMA TB-3001, and IGMA TM-3000 unless specified otherwise.
- B. Glaze in accordance with recommendations of glazing and framing manufacturers, and as required to meet the Performance Test Requirements specified in other applicable sections of specifications.
- C. Set glazing without bending, twisting, or forcing of units.
- D. Do not allow glass to rest on or contact any framing member.
- E. Glaze doors and operable sash, in a securely fixed or closed and locked position, until sealant, glazing compound, or putty has thoroughly set.
- F. Tempered Glass: Install with roller distortions in horizontal position unless otherwise directed.
- G. Transparent (One-Way Vision Glass) Mirror: Use continuous channel glazing gasket.
- H. Laminated Glass:
 - 1. Tape edges to seal interlayer and protect from glazing sealants.
 - 2. Do not use putty or glazing compounds.
- I. Fire Protective and Fire Resistance Glass:
 - 1. Wire Glass: Glaze in accordance with NFPA 80.
 - 2. Other fire protective and fire resistant glass: Glaze in accordance with manufacturer's installation instructions and NFPA 80.

3.4 INSTALLATION - DRY METHOD (TAPE AND GASKET SPLINE GLAZING)

- A. Cut glazing tape to length; install on glazing pane. Seal corners by butting and sealing junctions with butyl sealant.
- B. Place setting blocks at 1/4 points with edge block no more than 150 mm (6 inches) from corners.
- C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure to attain full contact.

- D. Install removable stops without displacing glazing spline. Exert pressure for full continuous contact.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Trim protruding tape edge.

3.5 INSTALLATION - WET/DRY METHOD (PREFORMED TAPE AND SEALANT)

- A. Cut glazing tape to length and set against permanent stops, 5 mm (3/16 inch) below sight line. Seal corners by butting tape and dabbing with butyl sealant.
- B. Apply heel bead of butyl sealant along intersection of permanent stop with frame ensuring full perimeter seal between glass and frame to complete the continuity of the air and vapor seal.
- C. Place setting blocks at 1/4 points with edge block no more than 152 mm (6 inches) from corners.
- D. Rest glazing on setting blocks and push against tape and heel bead of sealant with sufficient pressure to achieve full contact at perimeter of pane or glass unit.
- E. Install removable stops, with spacer strips inserted between glazing and applied stops, 6 mm (1/4 inch) below sight line. Place glazing tape on glazing pane or unit with tape flush with sight line.
- F. Fill gap between glazing and stop with sealant to depth equal to bite of frame on glazing, but not more than 9 mm (3/8 inch) below sight line. Sealant type is to be compatible with glazing tape.
- G. Apply cap bead of sealant along void between the stop and the glazing, to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

3.6 INSTALLATION - WET METHOD (SEALANT AND SEALANT)

- A. Place setting blocks at 1/4 points and install glazing pane or unit.
- B. Install removable stops with glazing centered in space by inserting spacer shims both sides at 600 mm (24 inch) intervals, 6 mm (1/4 inch) below sight line.
- C. Fill gaps between glazing and stops with sealant to depth of bite on glazing, but not more than 9 mm (3/8 inch) below sight line to ensure full contact with glazing and continue the air and vapor seal.

- D. Apply sealant to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

3.7 INSTALLATION - INTERIOR WET/DRY METHOD (TAPE AND SEALANT)

- A. Cut glazing tape to length and install against permanent stops, projecting 1.6 mm (1/16 inch) above sight line.
- B. Place setting blocks at 1/4 points with edge block no more than 150 mm (6 inches) from corners.
- C. Rest glazing on setting blocks and push against tape to ensure full contact at perimeter of pane or unit.
- D. Install removable stops, spacer shims inserted between glazing and applied stops at 600 mm (24 inch) intervals, 6 mm (1/4 inch) below sight line.
- E. Fill gaps between pane and applied stop with sealant to depth equal to bite on glazing, to uniform and level line. Sealant type is to be compatible with glazing tape.
- F. Trim protruding tape edge.

3.8 INSTALLATION - INTERIOR WET METHOD (COMPOUND AND COMPOUND)

- A. Install glazing resting on setting blocks. Install applied stop and center pane by use of spacer shims at 600 mm (24 inch) centers, kept 6 mm (1/4 inch) below sight line.
- B. Locate and secure glazing pane using glazers' clips.
- C. Fill gaps between glazing and stops with glazing compound until flush with sight line. Tool surface to straight line.

3.9 REPLACEMENT AND CLEANING

- A. Clean new glass surfaces removing temporary labels, paint spots, and defacement after approval by COR.
- B. Replace cracked, broken, and imperfect glass, or glass which has been installed improperly.
- C. Leave glass, putty, and other setting material in clean, whole, and acceptable condition.

3.10 PROTECTION

- A. Protect finished surfaces from damage during erection, and after completion of work.
Strippable plastic coatings on colored anodized finish are not acceptable.

3.11 MONOLITHIC GLASS SCHEDULE

A. Glass Type MG# 1: Clear fully tempered float glass.

1. Unit Thickness: 6 mm (0.23 inch)
2. Safety glazing label required.

3.12 LAMINATED GLASS SCHEDULE

A. Glass Type LG# 1: Clear laminated glass with two (2) lites of fully tempered float glass.

1. Minimum Thickness of Each Glass Lite: 3 mm (0.12 inch).
2. Interlayer Thickness: 1.52 mm (0.060 inch).
3. Safety glazing label required.
4. Application: Interior glazing of units unless otherwise scheduled.

3.13 FIRE-PROTECTIVE AND FIRE-RESISTANCE GLAZING SCHEDULE

A. Glass Type FR# 1: Fire-protection-rated tempered glass.

1. Thickness: 6 mm (0.23 inch)
2. Rating: 20 minutes.
3. Application: Fire-protection-rated door assemblies with openings not over 0.65 square meter (100 square inch).

B. Glass Type FR# 2: Fire-protection-rated laminated glass with intumescent interlayers.

1. Thickness: 6 mm (0.23 inch) minimum.
2. Rating: 45- minute.
3. Application: Fire-protection-rated door and window assemblies.

--- E N D ---

SECTION 08 84 00
PLASTIC GLAZING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies acrylic glazing.

1.2 RELATED WORK

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.3 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on plastic glazing, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 00, SUBMITTAL PROCEDURES.
- B. Product Data: Submit manufacturer's product data; include product description, fabrication information, and compliance with specified performance requirements.
- C. Samples: For each color and finish of plastic glazing indicated, minimum 2 inch x 2 inch (300 mm) square and of same thickness indicated for final Work. Indicate full color, texture, and pattern variation.
- D. Submit product test reports from a qualified independent 3rd party testing agency indicating each type and class of panel system complies with the project performance requirements, based on comprehensive testing of current products. Previously completed test reports will be acceptable if for current manufacturer and indicative of products used on this project.
 - 1. Test reports required are:
 - a. Rate of Burning (ASTM D 635)
 - b. Self-Ignition Temperature (ASTM D 1929)
 - c. Density of Smoke (ASTM D 2843)
 - d. Flame Spread and Smoke Developed testing (ASTM E 84)
 - e. Room Corner Burn Test (NFPA 286)

- f. Extent of Burning (UL 94)
 - g. Impact strength (ASTM D 3763)
 - h. Safety glazing impact resistance (ANSI Z97.1-2004)
 - i. UPITT Test for Combustion Product Toxicity
 - j. Passes NFPA 269/ASTM1678 for Combustion Product Toxicity
 - k. Dynamic environmental testing (ASTM standards D 5116 or D 6670)
 - l. UL Yellowcard
- E. Building Approvals: Plastic Fabrications are to have been evaluated and must be registered with and comply to requirements of the following jurisdictions:
 - 1. Los Angeles Department of Building and Safety (Product must have a LARR [Los Angeles Research Report] number) for use as Light-transmitting Panels
 - 2. ICC-ES Report for Light Transmitting Plastics and Interior Finishes
- F. Shop Drawings: Include plans, elevations, sections, panel dimensions, details, and attachments to other work.
- G. Maintenance Data: Submit manufacturer's care and maintenance data, including care, repair and cleaning instructions. Include in Project closeout documents.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For plastic glazing to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021 to conduct the testing indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect plastic glazing materials according to manufacturer's written instructions. Prevent damage to plastic glazing and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. Maintain protective coverings on plastic glazing to avoid exposures to abrasive substances, excessive heat, and other sources of possible deterioration.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not proceed with plastic glazing when ambient and substrate temperature conditions are outside limits permitted by plastic glazing

material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1.9 WARRANTY

- A. Manufacturer's Special Warranty on Plastic Fabrications: Manufacturer's standard form agreeing to repair or replace units that fail in material or workmanship within the specified warranty period.
- B. Warranty Period: One year from date of Substantial Completion.
- C. The warranty shall not deprive the Owner of other rights or remedies the Owner may have under provisions of the Contract Documents, and is in addition to and runs concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain plastic glazing from single source from single manufacturer. Obtain sealants from single source from single manufacturer for each product and installation method.

2.2 PERFORMANCE REQUIREMENTS

- A. Plastic glazing sheets and glazing materials shall withstand normal temperature changes, wind, and impact loads without failure, including loss or breakage of plastic sheets attributable to the following: failure of sealants or gaskets to remain watertight and airtight, deterioration of plastic sheet and glazing materials, or other defects in materials and installation.
- B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on plastic glazing and glazing framing members.
- C. Fire-Test-Response Characteristics of Plastic Glazing: As determined by testing plastic glazing by a qualified testing agency acceptable to authorities having jurisdiction.
 - 1. Self-ignition temperature of 650 deg F (343 deg C) or higher when tested according to ASTM D1929 on plastic sheets in thicknesses indicated for the Work.

2. Smoke density of 75 or less when tested according to ASTM D2843 on plastic sheets in thicknesses indicated for the Work.
3. Flame-spread index of not less than that indicated when tested according to ASTM E84.

2.3 PLASTIC GLAZING, GENERAL

- A. Glazing Publication: Comply with published instructions of plastic glazing manufacturers and with GANA's "Glazing Manual" unless more stringent requirements are indicated. See this publication for definitions of glazing terms not otherwise defined in this Section or in other referenced standards.
- B. Plastic Glazing Labeling: Identify plastic sheets with appropriate markings of applicable testing and inspecting agency, indicating compliance with required fire-test-response characteristics.

2.4 MATERIALS

- A. Varia Ecoresin Sheet
 1. Engineered co-polyester resin
 2. Sheet size: Maximum 4' x 10'
 3. Basis of Design Product: The design of Plastic Fabrications is based on Varia Ecoresin as provided by 3form, LLC. Products from other manufacturers must be approved by the Architect/Designer and COR prior to bidding in coordination with the Instructions to Bidders and Section 10 60 00 "Product Requirements".
- B. Interlayer Materials: Compatible with polyesters and bonding process to create a monolithic sheet of material when complete.
- C. Sheet minimum performance attributes:
 1. Rate of Burning (ASTM D 635). Material must attain CC1 Rating for a nominal thickness of 1.5 mm (0.060 in.) and greater.
 2. Self-Ignition Temperature (ASTM D 1929). Material must have a Self-ignition temperature greater than 650°F.
 3. Density of Smoke (ASTM D 2843). Material must have a smoke density less than 75%.
 4. Flame spread and Smoke developed testing (ASTM E 84). Material must be able to meet a level of Class A (Flame spread less than 25 and smoke less than 450) at thickness of 1/8", 3/16" and 1".
 5. Room Corner Burn Test (NFPA 286). Material must meet Class A criteria at 1/4" (walls only) and 3/8" (walls only/standoffs only) thickness as described by the 2012 International Building Code.
 6. Extent of Burning (UL 94). Must submit UL card.

7. Impact strength. Minimum impact strength test as measured by ASTM D 3763 of 20 ft. lbs. (for durability, shipping, installation, and use).
 8. Safety Glazing. Material must attain a Class A impact rating in accordance with ANSI Z97.1-2004 at 1/8" thickness.
 9. UPITT Test for Combustion Product Toxicity: Product must be recorded as "not more toxic than wood".
 10. NFPA 269/ASTM 1678 test for toxicity: Product must have a best predicted LC50 value ≤ 80.8 g/m³ Product must have a best predicted corrected for post-flashover conditions LC50 value ≤ 19.0 g/m³
 11. Dynamic environmental testing (ASTM standards D 5116 or D 6670). Panels must not have detectable VOC off-gassing agents and must be have Greenguard™ Indoor Air Quality Children and Schools certified.
 12. Panels must be produced from a minimum of 40% pre-consumer recycle content. This recycle content must be certified by a recognized 3rd party certification group, such as Scientific Certification Systems (SCS).
 13. Building Approvals: Plastic Fabrications are to have been evaluated and must be registered with and comply to requirements of the following jurisdictions:
 - a. New York Department of Buildings (Product must have an MEA [Materials and Equipment Acceptance] number) for use as Interior Finishes
 - b. Los Angeles Department of Building and Safety (Product must have a LARR [Los Angeles Research Report] number) for use as Light-transmitting Panels
 - c. ICC-ES Report for Interior Finishes and Light Transmitting plastics
- D. Plastic Glazing (RES1): Transparent acrylic sheet using 3form 200.57 ILTUO SimpleSpec ILTUO Cantilevered I system for custom installation.
1. Manufacturer: 3form Inc., Salt Lake City, Utah, USA / telephone 801-649-2500
 2. Material: Varia Ecoresin Sheet
 3. Thickness: 0.050 inch (12.7 mm)
 4. Style: Birch
 - a. Pattern should recede all edges by ½ inch
 5. Finish: Sandstone F01 (both sides)
 6. Edges: Sanded
 - a. Provide eased edge at outside edges.
 - b. Radius outside exposed corners 1/8 inch.
- E. Plastic Glazing (RES2) : Transparent acrylic sheet using 3form 300.01 SimpleSpec Varia Stand-Off Wall Feature system.
1. Manufacturer: 3form Inc., Salt Lake City, Utah, USA / telephone 801-649-2500
 2. Material: Varia Ecoresin Sheet
 3. Thickness: 0.050 inch (12.7 mm)
 4. Style: Dust N61
 5. Finish: Sandstone F01 (both sides)
 6. Edges: Sanded
 - a. Provide eased edge at outside edges.

- b. Radius outside exposed corners 1/8 inch.
- 7. Basis of Design Product: The design of Plastic Fabrications is based on Varia Ecoresin as provided by 3form, LLC. Products from other manufacturers must be approved by the Architect/Designer and COR prior to bidding in coordination with the Instructions to Bidders and Section 10 60 00 "Product Requirements".

2.5 FABRICATION

- A. Fabricate plastic glazing to designs, sizes, and thicknesses indicated and to comply with designated standards. Sizes and other characteristics are indicated on drawings.
- B. Allow for thermal expansion and contraction of plastic glazing without restraint and without withdrawal of edges from frames, with edge clearances and tolerances complying with plastic glazing manufacturer's written instructions.
- C. Comply with manufacturer's written recommendations for fabrication.
- D. Machining: Acceptable means of machining are listed below. Ensure that material is not chipped or warped by machining operations.
 - 1. Sawing: Select equipment and blades suitable for type of cut required.
 - 2. Drilling: Drills specifically designed for use with plastic products.
 - 3. Milling: Climb cut where possible.
 - 4. Routing
 - 5. Tapping
- E. Forming: Form products to shapes indicated using the appropriate method listed below. Comply with manufacturer's written instructions.
 - 1. Cold Bending
 - 2. Hot Bending
 - 3. Thermoforming: Acceptable only on uncoated material.
 - 4. Drape Forming
 - 5. Matched Mold Forming
 - 6. Mechanical Forming
- F. Form, fabricate and assemble products as indicated on drawings.

2.6 MISCELLANEOUS MATERIALS

- A. General: Provide products of material, size, and shape required for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaner: Type recommended by manufacturer.

- C. Fasteners: Use screws designated specifically for plastics. Self-threading screws are acceptable for permanent installations. Provide threaded metal inserts for applications requiring frequent disassembly such as light fixtures.
- D. Bonding Cements: May be achieved with solvents of adhesives suitable for use with product and application.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine plastic glazing framing, with glazing Installer present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 - 2. Minimum required face or edge clearances.
 - 3. Effective sealing between joints of plastic glazing framing members.
- B. Proceed with glazing only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Comply with manufacturer's written instructions for the installation of Plastic Fabrications.
- B. Manufacturer's shop to fabricate items to the greatest degree possible.
- C. Utilize fasteners, adhesives and bonding agents recommended by manufacturer for type of installation indicated. Material that is chipped, warped, hazed, or discolored as a result of installation or fabrication methods will be rejected.
- D. Install components plum, level and rigid, scribed to adjacent finishes, in accordance with the approved shop drawings and product data.
- E. Form field joints using manufacturer's recommended methods. Locate seams in panels so they are not directly in line with seams in substrates.

3.3 CLEANING AND PROTECTION

- A. Protect surfaces from damage until date of substantial completion. Repair work or replace damaged work, which cannot be repaired to Architect's satisfaction.

--- E N D ---

**SECTION 08 90 00
LOUVERS AND VENTS**

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. This section specifies fixed and operable wall louvers, door louvers and wall vents.

1.2 RELATED WORK:

- A. Louvers in Steel Doors: Section 08 11 13, HOLLOW METAL DOORS AND FRAMES.
B. Color of finish: Section 09 06 00, SCHEDULE FOR FINISHES.
C. Louvers in lead lined wood doors: Section 13 49 00, RADIATION PROTECTION.

1.3 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
B. Shop Drawings:
1. Each type, showing material, finish, size of members, operating devices, method of assembly, and installation and anchorage details.
C. Manufacturer's Literature and Data:
1. Each type of louver and vent.
D. Color samples.

1.4 APPLICABLE PUBLICATIONS:

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
B. The Master Painters Institute (MPI):
Approved Product List – Updated Monthly
C. ASTM International (ASTM):
A240/A240M-14Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
A653/A653M-13Steel Sheet Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot Dip Process

A1008/A1008M-13Steel, Sheet, Carbon, Cold Rolled, Structural, and High
Strength Low-Alloy with Improved Formability
B209-14Aluminum and Aluminum Alloy, Sheet and Plate
B209M-14.....Aluminum and Aluminum Alloy, Sheet and Plate (Metric)
B221-14Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire,
Shapes, and Tubes
B221M-13.....Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire,
Shapes, and Tubes (Metric)
D1187/D1187M-97(R2011) ...Asphalt-Base Emulsions for Use as Protective Coatings for
Metal

D. National Association of Architectural Metal Manufacturers (NAAMM):

AMP 500-06Metal Finishes Manual

E. National Fire Protection Association (NFPA):

90A-15Installation of Air Conditioning and Ventilating Systems

G. American Architectural Manufacturers Association (AAMA):

2605-13High Performance Organic Coatings on Architectural
Extrusions and Panels

H. Air Movement and Control Association, Inc. (AMCA):

500-L-07Testing Louvers

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. Aluminum, Extruded: ASTM B221M (B221).
- B. Stainless Steel: ASTM A240/A240M, Type 302B.
- C. Galvanized Steel Sheet: ASTM A653/A653M; G90 min.
- D. Carbon Steel and Sheet: ASTM A1008/A1008M (interior use louvers only).
- E. Aluminum, Plate and Sheet: ASTM B209M (B209); alloy 3003 or 5005 with temper as required for forming.
- F. Fasteners: Fasteners for securing louvers and wall vents to adjoining construction, except as otherwise specified or indicated in construction documents, to be toggle or

expansion bolts of size and type as required for each specific type of installation and service condition.

1. Where type, size, or spacing of fasteners is not shown or specified, submit shop drawings showing proposed fasteners, and method of installation.
2. Fasteners for louvers, louver frames, and wire guards to be of stainless steel or aluminum with same finish as louvers.
3. Fasteners for louvers, louver frames and wire guards within mental health areas to be non-removable/tamper-proof type.

G. Inorganic Zinc Primer: MPI No. 19.

H. Bituminous Coating: ASTM D1187/D1187M; cold applied asphalt mastic emulsion.

2.2 EXTERIOR WALL LOUVERS:

A. General:

1. Provide fixed and operable type louvers of size and design shown.
2. Heads, sills and jamb sections are to have formed caulking slots or be designed to retain caulking. Head sections are to have exterior drip lip, and sill sections an integral water stop.
3. Furnish louvers with sill extension or separate sill as shown.
4. Frame is to be mechanically fastened or welded construction with welds dressed smooth and flush.

B. Performance Characteristics:

2. Louvers are to bear AMCA certified rating seals for air performance and water penetration ratings.

C. Aluminum Louvers:

1. General: Frames, blades, sills and mullions (sliding interlocking type); 0.078-inch thick extruded 6063-T5 or -T52 aluminum. Blades to be standard type and have reinforcing bosses.
2. Louvers, fixed: Make frame sizes 1/2-inch smaller than openings. Single louver frames are not to exceed 66 inches wide. When openings exceed 66 inches, provide twin louvers separated by mullion members.

3. Louvers are to withstand the effects of gravity loads and the following wind loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver-blade rattle or flutter, or permanent damage to fasteners and anchors.
 - a. Wind load acting inward or outward of not less than 1436 Pa (30 lb. per sq. ft.).
4. Louvers, operable: Louver frame opening sizes, single louver sizes and mullion requirements are to be as specified for fixed louvers.
 - a. Blades: Attach blades to frame with aluminum pivot pins through nylon bearings. Fasten each blade to stainless steel operation arms that are connected to minimum 1/8-inch thick stainless steel operating bar arranged for simultaneous operation of blades.
 - b. Spring/chain operation: Exposed operator activated by spring attached to operating bar handle and mounted on frame. Control of louver to be by pull chain of required length to be operable from floor. Provide pulleys and brackets as required.
 - c. Hand crank operation: Hand crank operator activated by case hardened gears concealed in aluminum housing. Operators are to be removable and located at jambs. Provide one right-handed operator for each louver.
 - d. Motor operation: Motor operated by approved electric motor. Motors are to be removable and located at jambs of louver. Connect motor operator lever arm to operating bar by means of stainless steel connecting rod.
 - e. Automatic operation: Louvers are to be complete with weights, pull chain, chain holder and brackets, cables, sheaves, spring, 70 degrees C (160 degrees F) fusible link, and other related items meeting requirements of NFPA 90A. Provide non-ferrous bearings and spindles of replaceable type. Louvers are to close automatically in case of fire.
- D. Stainless Steel Louvers: Form stainless steel louvers using 0.063-inch thick sheet for frames, blades, sills and mullions.

1. Provide louver with fixed 45 degree standard drainable blades with water baffle.
Make overall frame size 1/2-inch less than opening, unless otherwise indicated in construction documents.
 2. Single louver sections are not to exceed 66 inches in width. For openings larger than 66 inches wide, provide multiple sections not larger than 66 inches wide separated by mullions.
- E. Formed Steel Louvers: Form galvanized louvers using 0.059-inch thick sheet for frames, blades, sills and mullions.
1. Provide louver with fixed 45 degree standard blades with water baffle. Make overall frame size 1/2-inch less than opening, unless otherwise indicated in construction documents.
 2. Single louver sections are not to exceed 66 inches in width. For openings larger than 66 inches wide, provide multiple sections not larger than 66 inches side separated by mullions.

2.3 CLOSURE ANGLES AND CLOSURE PLATES:

- A. Fabricate from 0.078-inch thick stainless steel or aluminum.
- B. Provide continuous closure angles and closure plates on inside head, jambs and sill of exterior wall louvers.
- C. Secure angles and plates to louver frames with screws, and to masonry or concrete with fasteners as indicated in construction documents.

2.4 WIRE GUARDS:

- A. Provide wire guards on outside of all exterior louvers, except on exhaust air louvers.
- B. Fabricate frames from 0.078-inch thick extruded or sheet aluminum designed to retain wire mesh.
- C. Wire mesh to be woven from not less than 0.063-inch diameter aluminum wire in 1/2-inch square mesh.
- D. Miter corners and join by concealed corner clips or locks extending not less than 2-1/4 inches into rails and stiles. Equip wire guards over 4 feet in height with a mid-rail constructed as specified for frame components.

- E. Fasten frames to outside of louvers with aluminum or stainless steel devices of same finish as louvers designed to allow removal and replacement without damage to the wire guard or the louver.

2.5 BLANK-OFF PANELS:

- A. Uninsulated panels attached with clips or screws as follows: Panel finish is to be same finish applied to louvers
 - 1. Aluminum sheet for aluminum louvers, 0.050 inch minimum thickness.
 - 2. Galvanized-steel sheet for galvanized-steel louvers, 0.040 inch minimum.
 - 3. Stainless-steel sheet for stainless-steel louvers, not less than 0.038 inch minimum.
- B. Insulated laminated panels consisting of an insulating core surfaced on back and front with metal sheets and attached to back of louver with clips on screws and gasketed or sealant sealed perimeter. Panel finish is to be same finish applied to louvers
 - 1. Thickness: 1 inch.
 - 2. Aluminum sheet for aluminum louver 0.032 inch minimum.
 - 3. Galvanized-steel sheet for galvanized-steel louver 0.028 inch minimum.
 - 4. Stainless-steel sheet for stainless-steel louvers 0.031 inch minimum.
 - 5. Insulating Core: Rigid, glass-fiber-board insulation

2.6 EXTERIOR DOOR LOUVERS:

- A. Fabricate of 0.063-inch thick extruded aluminum. Miter frames at corners and join by concealed corner brackets. Louvers are to be weather resistant type.
- B. Equip louvers on outside with wire guards, except omit wire guards for louvers in doors located completely below enclosed areaways.

2.7 INTERIOR DOOR LOUVERS:

- A. Fabricate louvers for interior doors and partitions of 0.0472-inch thick steel
- B. Make louvers sight-proof type with stationary blades, except where light-proof louvers are required .
- C. Lightproof louvers are to have stationary blades and be designed to exclude passage of light but permit free ventilation.

2.8 WALL VENTS:

- A. Fabricate exterior wall vents from either 0.185-inch thick aluminum plate or 1/4-inch thick cast iron, perforated in diamond lattice pattern, with not over 3/4-inch openings.
- B. Vents are to have aluminum screen frame with aluminum alloy insect screening mounted on back of vent by means of 3/4-inch by 3/16-inch top and bottom bars screwed to grille.
- C. Vent Frames in Masonry: Fabricate of 1-3/4 inch by 1-1/4 inch by 3/16-inch steel angles bolted with 1/4-inch diameter expansion bolts at jambs.

2.9 AIR INTAKE VENTS:

- A. Fabricate exterior louvered wall ventilators for fresh air intake for air conditioning units from extruded aluminum, ASTM B221M (B221). Form with integral horizontal louvers and frame, with drip extending beyond face of wall and integral water stops.
- B. Provide aluminum closures where shown for inside face of dummy vents.
- C. Provide 0.032-inch thick aluminum sleeves where indicated in construction documents.

2.10 BRICK VENTS:

- A. Vents are to be of size shown formed of approximately 0.125 inch thick cast aluminum, or 0.118 inch extruded aluminum.
- B. Provide vents complete with aluminum screen frame with corrosion resistant insect screening mounted on back of vent.
- C. Provide vents with required anchors.

2.11 FINISH:

- A. In accordance with NAAMM Metal Finishes Manual: AMP 500-505
- B. Aluminum Louvers:
 - 1. Anodized finish
 - a. AA-M1X, Mill finish, as fabricated.
 - 2. Organic Finish: AAMA 2605 (Fluorocarbon coating) with total dry film thickness of not less than 1.2 mil, color as indicated in Section 09 06 00, SCHEDULE FOR FINISHES.
- C. Aluminum Wall Vents and Brick Vents: Sand blasted satin finish.

- D. Stainless Steel: Mechanical finish No. 4 in accordance with NAAMM Metal Finishes Manual.
- E. Galvanized Sheet Steel: Two-coat baked-enamel or powder-coat finish consisting of prime coat and thermosetting topcoat, with a minimum dry film thickness of 2 mils.
 - 1. Paint interior surfaces of lightproof louvers with two (2) additional finish shop coats of baked-on flat black enamel.
 - 2. Finish painting of exposed surfaces of shop primed louvers is specified in Section 09 91 00, PAINTING.
 - 3. Manufacturer finished louvers and blank-off panels are to have color as indicated in Section 09 06 00, SCHEDULE FOR FINISHES.
- F. Steel: Surfaces of steel work, for which no other finish is specified, are to be cleaned free from scale, rust, oil and grease, and then given a light colored prime paint after fabrication, except ferrous metals concealed in finished work. Paint all contact surfaces of assembled work (except welded contact surfaces) with an additional shop coat of similar paint.

2.12 PROTECTION:

- A. Provide protection for aluminum against galvanic action wherever dissimilar materials are in contact, by painting the contact surfaces of the dissimilar material with a heavy coat of bituminous coating (complete coverage), or by separating the contact surfaces with a performed synthetic rubber tape having pressure sensitive adhesive coating on one side.
- B. Isolate the aluminum from plaster, concrete and masonry by coating aluminum with zinc-chromate primer.
- C. Protect finished surfaces from damage during fabrication, erection, and after completion of the work. Strippable plastic coating on colored anodized finish is not approved.

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. Set work accurately, in alignment and where indicated in construction documents.
Install plumb, level, free of rack and twist, and set parallel or perpendicular as required to line and plane of surface.
- B. Furnish setting drawings and instructions for installation of anchors and for the positioning of items having anchors to be built into masonry construction. Provide temporary bracing for such items until masonry is set.
- C. Provide anchoring devices and fasteners as shown and as necessary for securing louvers and vents to building construction as specified. Power actuated drive pins may be used, except for removal items and where members would be deformed or substrate damaged by their use.
- D. Set wall louvers and vents in masonry walls during progress of the work. If wall louvers and vents are not delivered to job in time for installation in prepared openings, make provision for later installation. Set in cast-in-place concrete in prepared openings.

3.2 CLEANING AND ADJUSTING:

- A. After installation, all exposed prefinished and plated items and all items fabricated from stainless steel and aluminum are to be cleaned as recommended by the manufacturer and protected from damage until completion of the project.
- B. All movable parts, including hardware, are to be cleaned and adjusted to operate as designed without binding or deformation of the members, so as to be centered in the opening of frame, and where applicable, to have all contact surfaces fit tight and even without forcing or warping the components.
- C. Restore louvers and vents damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Contracting Officer Representative (COR) damaged units and replace with new units.

--- E N D ---

SECTION 09 05 16
SUBSURFACE PREPARATION FOR FLOOR FINISHES

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies subsurface preparation requirements for areas to receive the installation of applied and resinous flooring. This section includes testing concrete for moisture and pH, remedial floor coating for concrete floor slabs having unsatisfactory moisture or pH conditions, floor leveling, and repair as required.

1.2 RELATED WORK

- A. Section 09 65 16, RESILIENT SHEET FLOORING, Section 09 65 19, RESILIENT TILE FLOORING, Section 09 68 00, CARPETING

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA and TEST DATA.
- B. Written approval confirming product compatibility with subfloor material manufacturer and the flooring manufacturer
- C. Product Data:
 - 1. Moisture remediation system
 - 2. Underlayment Primer
 - 3. Cementitious Self-Leveling Underlayment
 - 4. Cementitious Trowel-Applied Underlayment (Not suitable for resinous floor finishes)
- D. Test Data:
 - 1. Moisture test and pH results performed by a qualified independent testing agency or warranty holding manufacturer's technical representative.

1.4 DELIVERY AND STORAGE

- A. Deliver materials in containers with labels legible and intact and grade-seals unbroken.
- B. Store material to prevent damage or contamination.

1.5 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this specification to the extent referenced.

Publications are referenced in text by basic designation only.

B. American Society for Testing and Materials (ASTM):

D638-10 (2010)	Test Method for Tensile Properties of Plastics
D4259-88 (2012)	Standard Practice for Abrading Concrete to alter the surface profile of the concrete and to remove foreign materials and weak surface laitance.
C109/C109M-12 (2012)	Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens) Modified Air Cure Only
D7234-12 (2012)	Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers.
E96/E96M - 12 (2012)	Standard Test Methods for Water Vapor Transmission of Materials
F710-11 (2011)	Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring
F1869-11 (2011)	Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
F2170-11 (2011)	Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes
C348-08 (2008)	Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars
C191-13 (2013)	Standard Test Method for Time of Setting of Hydraulic Cement by Vicat Needle

PART 2 - PRODUCTS

2.1 MOISTURE REMEDIATION COATING

A. System Descriptions:

1. High-solids, epoxy system designed to suppress excess moisture in concrete prior to an overlayment. For use under resinous products, VCT, tile and carpet where issues caused by moisture vapor are a concern.

B. Products: Subject to compliance with applicable fire, health, environmental, and safety requirements for storage, handling, installation, and clean up.

- C. System Components: Verify specific requirements as systems vary by manufacturer. Verify build up layers and installation method. Verify compatibility with substrate. Use manufacturer's standard components, compatible with each other and as follows:
1. Liquid applied coating:
 - a. Resin: epoxy.
 - b. Formulation Description: Multiple component high solids.
 - c. Application: Per manufacturer's written installation requirements.
 - d. Thickness: minimum 10 mils
- D. Material Vapor Permeance: Application shall achieve a permeance rating of less than 0.1 perm in accordance with ASTM E96/E96M.
- E. Maximum RH requirement: 100% testing in accordance with ASTM F2170.

Property	Test	Value
Tensile Strength	ASTM D638	4,400 psi
Volatile Organic Compound Limits (V.O.C.)	SCAMD Rule 1113	25 grams per liter
Permeance	ASTM E96	0.1 perms
Tensile Modulus	ASTM D638	1.9X10 ⁵ psi
Percent Elongation	ASTM D638	12%
Cure Rate	Per manufacture's Data	4 hours Tack free with 24hr recoat window
Bond Strength	ASTM D7234	100% bond to concrete failure

2.2 CEMENTITIOUS SELF-LEVELING UNDERLAYMENT

- A. System Descriptions:
1. High performance self-leveling underlayment resurfacer. Single component, self-leveling, cementitious material designed for easy application as an underlayment for all types of flooring materials. It is used for substrate repair and leveling.

- B. Products: Subject to compliance with applicable fire, health, environmental, and safety requirements for storage, handling, installation, and clean up. Gypsum-based products are unacceptable.
- C. System Characteristics:
 - 1. Wearing Surface: smooth
 - 2. Thickness: Per architectural drawings, ranging from feathered edge to 1", per application. Applications greater than 1" require additional 3/8" aggregate to mix or as recommended by manufacturer.
- D. Underlayment shall be calcium aluminate cement-based, containing Portland cement. Gypsum-based products are unacceptable.
- E. Compressive Strength: Minimum 4100 psi in 28 days in accordance with ASTM C109/C109M.
- F. Flexural Strength: Minimum 1000 psi in 28 days in accordance with ASTM C348
- G. Dry Time: Underlayment shall receive the application of floor coverings in 16 hours or as recommended by manufacturer.
- H. Primer: compatible and as recommended by manufacturer for use over intended substrate
- I. System Components: Manufacturer's standard components that are compatible with each other and as follows:
 - 1. Primer:
 - a. Resin: copolymer
 - b. Formulation Description: single component ready to use.
 - c. Application Method: Squeegee and medium nap roller.
All puddles shall be removed, and material shall be allowed to dry, 1-2 hours at 70F/21C.
 - d. Number of Coats: (1) one.
 - 2. Grout Resurfacing Base:
 - a. Formulation Description: Single component, cementitious self-leveling high-early and high-ultimate strength grout.

- b. Application Method: colloidal mix pump, cam rake, spike roll.
 - 1) Thickness of Coats: Per architectural scope, 1" lifts.
 - 2) Number of Coats: More than one if needed.
- c. Aggregates: for applications greater than 1inch, require additional 3/8" aggregate to mix.

Property	Test	Value
Compressive Strength	ASTM C109/C109M	2,200 psi @ 24 hrs 3,000 psi @ 7 days
Initial set time Final Set time	ASTM C191	30-45 min. 1 to 1.5 hours
Bond Strength	ASTM D7234	100% bond to concrete failure

2.3 CEMENTITIOUS TROWEL-APPLIED UNDERLAYMENT (NOT SUITABLE FOR RESINOUS FLOOR FINISHES)

- A. Underlayment shall be calcium aluminate cement-based, containing Portland cement. Gypsum-based products are unacceptable.
- B. Compressive Strength: Minimum 4000 psi in 28 days
- C. Trowel-applied underlayment shall not contain silica quartz (sand).
- D. Dry Time: Underlayment shall receive the application of floor covering in 15-20 minutes.

PART 3 - EXECUTION

3.1 ENVIRONMENTAL REQUIREMENTS

- A. Maintain ambient temperature of work areas at not less than 16 degree C (60 degrees F), without interruption, for not less than 24 hours before testing and not less than three days after testing.
- B. Maintain higher temperatures for a longer period of time where required by manufacturer's recommendation.
- C. Do not install materials when the temperatures of the substrate or materials are not within 60-85 degrees F/ 16-30 degrees C.

3.2 SURFACE PREPARATION

- A. Concrete shall meet the requirements of ASTM F710 and be sound, solid, clean, and free of all oil, grease, dirt, curing compounds, and any substance that might act as a bond-breaker before application. As required prepare slab by mechanical methods. No chemicals or solvents shall be used.
- B. General: Prepare and clean substrates according to flooring manufacturer's written instructions for substrate indicated.
- C. Prepare concrete substrates per ASTM D4259 as follows:
 - 1. Dry abrasive blasting.
 - 2. Wet abrasive blasting.
 - 3. Vacuum-assisted abrasive blasting.
 - 4. Centrifugal-shot abrasive blasting.
 - 5. Comply with manufacturer's written instructions.
- D. Repair damaged and deteriorated concrete according to flooring manufacturer's written recommendations.
- E. Verify that concrete substrates are dry.
- F. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with application only after substrates have maximum moisture-vapor-emission rate of per flooring manufactures formal and project specific written recommendation.
- G. Perform in situ probe test, ASTM F2170. Proceed with application only after substrates do not exceed a maximum potential equilibrium relative humidity per flooring manufacture's formal and project specific written recommendation.
- H. Provide a written report showing test placement and results.
- I. Alkalinity: Measure surface pH in accordance with procedures provided in ASTM F710 or as outlined by qualified testing agency or flooring manufacturer's technical representative.
- J. Tolerances: Subsurface shall meet the flatness and levelness tolerance specified on drawings or recommended by the floor finish manufacturer. Tolerance shall also not to

exceed 1/4" deviation in 10'. As required, install underlayment to achieve required tolerance.

- K. Other Subsurface: For all other subsurface conditions, such as wood or metal, contact the floor finish or underlayment manufacturer, as appropriate, for proper preparation practices.

3.3 MOISTURE REMEDIATION COATING:

- A. Where results of relative humidity testing (ASTM F2170) exceed the requirements of the specified flooring manufacturer, apply remedial coating as specified to correct excessive moisture condition.
- B. Prior to remedial floor coating installation mechanically prepare the concrete surface to provide a concrete surface profile in accordance with ASTM D4259.
- C. Mix and apply moisture remediation coating in accordance with manufacturer's instructions.

3.4 CEMENTITIOUS UNDERLAYMENT:

- A. Install cementitious self-leveling underlayment as required to correct surface defects, floor flatness or levelness corrections to meet the tolerance requirements as or detailed on drawings, address non-moving cracks or joints, provide a smooth surface for the installation of floor covering, or meet elevation requirements detailed on drawings.
- B. Mix and apply in accordance with manufacturer's instructions.

3.5 PROTECTION

- A. Prior to the installation of the finish flooring, the surface of the underlayment should be protected from abuse by other trades by the use of plywood, tempered hardwood, or other suitable protection course

3.6 FIELD QUALITY CONTROL

- A. Where specified, field sampling of products shall be conducted by a qualified, independent testing facility.

--- E N D ---

SECTION 09 06 00
SCHEDULE FOR FINISHES

SECTION 09 06 00-SCHEDULE FOR FINISHES

VAMC: Boise VA Medical Center

Location: Boise, Idaho

Project no. and Name: #531-325 Construct Primary Care / Mental Health Building

Submission: Construction Document Submittal

Date: 07/23/2021

SECTION 09 06 00
SCHEDULE FOR FINISHES

PART I – GENERAL

1.1 DESCRIPTION

This section contains a coordinated system in which requirements for materials specified in other sections shown are identified by abbreviated material names and finish codes in the room finish schedule or shown for other locations.

1.2 MANUFACTURERS

Manufacturer's trade names and numbers used herein are only to identify colors, finishes, textures and patterns. Products of other manufacturer's equivalent to colors, finishes, textures and patterns of manufacturers listed that meet requirements of technical specifications will be acceptable upon approval in writing by contracting officer for finish requirements.

1.3 SUBMITALS

Submit in accordance with SECTION 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES-provide quadruplicate samples for color approval of materials and finishes specified in this section.

1.4 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in text by basic designation only.
- B. MASTER PAINTING INSTITUTE: (MPI)
 - 2001Architectural Painting Specification Manual

PART 2- PRODUCTS

2.1 DIVISION 03 – CONCRETE

A. SECTION 03 30 00, CAST IN PLACE CONCRETE

Surface	Finish Description
Concrete	Polished

2.2 DIVISION 04 – MASONRY

A. Section 04 05 13, MASONRY MORTARING and Section 04 05 16, MASONRY GROUTING

Manufacturer	Mfg. Color Name
Laticrete	Natural Gray

B. Section 04 20 00, UNIT MASONRY

1. FACE BRICK (FB)				
Finish Code	Size	Texture	Manufacturer	Mfg. Color Name/No.
FB	Modular	Matte	Interstate Brick	Terra Cotta

2.5 DIVISION 05 – METALS

A. SECTION 05 12 00, STRUCTURAL STEEL FRAMING

Finish	Color
Primed	Clear

B. SECTION 07 95 13, EXPANSION JOINT COVER ASSEMBLIES

Material	Finish
Steel	Dark Bronze

2.6 DIVISION 06 WOOD, PLASTICS, AND COMPOSITES

A. SECTION 06 20 00, FINISH CARPENTRY

1. RECEPTION COUNTER PUBLIC OR PATIENT SIDE						
Room No. and Name	Code	Component	Material	Manuf.	Pattern/Color	Notes
106 Reception	QZ1	Countertop	Quartz	Wilsonart	Issleburg	
	PLAM1	Vertical Surface(s)	High Pressure Decorative Laminate	Wilsonart	Shaker Cherry 7935-07	Grain to run vertical

	TRIM1	Trim	Metal Corner Trim	Fry Reglet	Millwork Corner Key	Install at outside corners of desk
	SST1	Base	Stainless Steel		Brushed Finish	See drawings for locations.

2. RECEPTION COUNTER STAFF SIDE						
Room No. and Name	Code	Component	Material	Manuf.	Pattern/Color	Notes
106 Reception	PLAM1	Vertical Surface(s) & Removable Plastic Laminate Panels	High Pressure Decorative Laminate	Wilsonart	Shaker Cherry 7935-07	Grain to run vertical
	PLAM2	Worksurface Countertop	Plastic Laminate	Formica	Mission White	
	TRIM1	Trim	Metal Corner Trim	Fry Reglet	Millwork Corner Key	Install at horizontal and vertical outside corners

	RB1	Resilient Base				See 2.9 Division 09 Finishes, section 09 65 13, RESILIENT BASE AND ACCESSORIES
--	-----	----------------	--	--	--	---

2.7 DIVISION 07 - THERMAL AND MOISTURE PROTECTION

A. SECTION 07 40 00, ROOFING AND SIDING PANELS

Finish	Manufacturer	Mfg. Color Name/No.
ONYX 7099	Swisspearl	Largot Carat
SAPPHIRE 7060	Swisspearl	Largot Carat
CRYSTAL 7010	Swisspearl	Largot Carat

B. SECTION 07 71 00 / 07 72 00, ROOF SPECIALITIES AND ACCESSORIES

Item	Material	Finish
Roof Hatch	Aluminum	Mill
Equipment Support	Galv. Steel	Paint
Gravity Ventilators	Aluminum	Mill
Grating Walkway	Galv Steel	Paint
Copings	Extruded Aluminum	Paint
Gravel Stops and Fascia System	Extruded Aluminum	Paint
Fascia Systems	Extruded Aluminum	Paint

Roof Expansion Joint Covers	Extruded Aluminum	Mill
-----------------------------	-------------------	------

C. SECTION 07 92 00, JOINT SEALANTS

Location	Color	Manufacturer	
Masonry Expansion Joints	Gray	NP1 Polyurethane Caulk	

2.8 DIVISION 08 - OPENINGS

A. SECTION 08 11 13, HOLLOW METAL DOORS AND FRAMES

Paint both sides of door and frames same color including ferrous metal louvers, and hardware attached to door	
Component	Color of Paint Type and Gloss
Door	Clear Anodized Finish
Frame	(P7) Finish: Semi-gloss, Color: SW6385 Dover White
Window frame	Clear Anodized Finish

B. SECTION 08 14 00, WOOD DOORS

Component	Finish/Color
Doors	Species: Cherry; Cut: Quarter; Finish: To be selected from manufacturer's full range of colors

C. SECTION 08 31 13, ACCESS DOORS AND FRAMES

Material	Finish/Color
Stainless steel	Clear

D. SECTION 08 51 13, ALUMINUM WINDOWS

Type	Finish	Manufacturer	Mfg. Color Name/No.
Hung	Paint	Kawneer Trifab	White
Fixed	Paint	Kawneer Trifab	White

E. WINDOW SILLS

Room No. and Name	Material	Finish
	Aluminum (With Windows)	

F. WINDOW STOOLS

Room No. and Name	Material	Manufacturer	Product Name	Pattern/Color	Notes
Typical, throughout project	Solid Surface	Corian	N/A	Cameo White	See drawings for typical window stool detail.

G. SECTION 08 71 00, BUILDERS HARDWARE

Item	Material	Finish
All Components	Stainless Steel	Brushed

H. SECTION 08 80 00, GLAZING

Glazing Type	Type	Manufacturer	Mfg. Color Name/No.
MG-1	Tempered	Kawneer Trifab	Clear
LG-1	Laminated	Kawneer Trifab	Clear
FR-1	Fire-Rated Tempered	Kawneer Trifab	Clear
FR-2	Fire-Rated Laminate	Kawneer Trifab	Clear
One-Way Glass	Transparent Mirror		Light-Gray

I. SECTION 08 84 00, PLASTIC GLAZING

Finish Code	Component	Manufacturer	Product Name	Pattern/Color	Size	Notes
RES1	Resin Divider Panel	3form	Varia Ecoresin Sheet	Style: Birch; Finish: Sandstone; Edges: Sanded	As indicated on drawings	Refer to specification section 08 84 00 Plastic Glazing
RES2	Resin Panel	3form	Varia Ecoresin Shet	Style: Dust N61; Finish: Sandstone; Edges: Sanded	As indicated on drawings	Refer to specification section 08 84 00 Plastic Glazing

2.9 DIVISION 09 - FINISHES

A. SECTION 09 30 13, CERAMIC TILING

1. SECTION 09 30 13, CERAMIC TILING						
Finish Code	Component	Manufacturer	Product Name	Pattern/Color	Size	Notes
PT1	Floor Tile	Marazzi	Bella Vista	Color: BV33 Smoke	12 inch x 24 inch (304 mm x 610 mm); 5/16 inch thick	Use Grout1. Refer to drawings for toilet room tile pattern. Install: stacked.
PT2	Wall Tile	American Olean	Concrete Chic	Color: Current Cream CC65, Finish: Matte	12 inch x 24 inch (304 mm x 610 mm); 5/16 inch thick	Use Grout2. Refer to drawings for toilet room tile pattern. Install: stacked.
PT3	Accent Wall Tile	Marazzi	Alterations	Color: Woven Slate AT64	1 inch x 3 inch stacked mosaic (304 mm x 304 mm); 3/8 inch thick	Use Grout1. Tile lines to run horizontal when installed. Refer to drawings for toilet room tile pattern.
PT4	Cove Tile Base	American Olean	Concrete Chic, P-36C9TB	Color: Current Cream CC65	6 inch x 12 inch (152 mm x 304 mm)	Use Grout2. Refer to drawings for toilet room tile pattern.
PT5	Tile Bullnose Trim	American Olean	Concrete Chic, P43C9	Color: Current Cream	3 inch x 12 inch (76 mm x 304 mm)	Use Grout2. Bullnose wall tile top trim. Refer to drawings for toilet room tile pattern.

TS1	Metal Cove Base	Schluter	DILEX-AHK	Finish: Satin Anodized Aluminum	As required for smooth transition between floor and wall tile.	
-----	--------------------	----------	-----------	------------------------------------	--	--

2. SECTION 09 30 13, GROUT

Finish Code	Manufacturer	Color Name/No	Size	Notes
Grout1	Mapei	09 Gray	1/8" joint	
Grout2	Mapei	01 Alabaster	1/8" joint	

B. SECTION 09 51 00, ACOUSTICAL CEILINGS

Finish Code	Manufacturer	Product Name	Pattern/Color	Size	Notes
AT1	USG	Radar #2310; Edge: Square	White	24 inch x 48 inch x 5/8 inch	Exposed grid: 15/16 inch, white
AT2	Armstrong	Clean Room Mylar RH90 #1716; Edge: Square	White	24 inch x 48 inch x 3/4 inch	Exposed grid: 15/16 inch, white
AT3	Armstrong	Clean Room Mylar RH90 #1721; Edge: Square	White	24 inch x 48 inch x 5/8 inch	Exposed grid: 15/16 inch, white
ACC1	Armstrong	Soundscapes Acoustical Canopies #6258	Sky (SK)	46-1/2 inch x 75 inch x 1- 1/4 inch	

C. SECTION 09 54 26, SUSPENDED WOOD CEILINGS

Finish Code	Manufacturer	Product Name	Pattern/Color	Size	Notes
LWC1 - Reception Back Wall & Lower Ceiling	Rulon International	Linear Panelized	Wood Species: Cherry; Finish: To be selected from manufacturer's full available range.	Refer to specification section 09 54 26 – 4"	Provide end caps or junction trims where indicated.
LWC2 - Reception Back Wall	Rulon International	Panel Grille	Wood Species: Cherry; Finish: To be selected from manufacturer's full available range.	Refer to specification section 09 54 26	Provide end caps or junction trims where indicated.
LWC3 – Vaulted Lobby / Vestibule Ceiling	Rulon International	Linear Panelized	Wood Species: Cherry; Finish: To be selected from manufacturer's full available range.	Refer to specification section 09 54 26 – 6"	Provide end caps or junction trims where indicated.

D. SECTION 09 65 19, RESILIENT TILE FLOORING

Finish Code	Description	Manufacturer	Product Name	Pattern/Color	Size	Notes
LVT1	Luxury Vinyl Tile	Teknoflor	T3 LVT	TX3501 Headquarters	18 inch x 18 inch (457 mm x 457 mm); 3.0 mm thick, non-cushioned	Install Method: Ashlar

LVT2	Luxury Vinyl Tile	Teknoflor	T3 LVT	TX3503 Spa	18 inch x 18 inch(457 mm x 457 mm); 3.0 mm thick, non-cushioned	Install Method: Ashlar
LVT3	Luxury Vinyl Tile	Mannington	Collection: The Drift; Style: Wood	Bristol Rosewood Classic D108	7.25" x 48" (184 mm x 1219 mm)	Install Method: Monolithic

E. SECTION 09 65 16, RESILIENT SHEET FLOORING

Finish Code	Description	Manufacturer	Product Name	Pattern/Color	Size	Notes
RSF1	Resilient Sheet Flooring	Tarkett Johnsonite	iQ Optima	207 Prairie Dancing CB	6'-6" wide rolls x 2.0 mm thick	Heat weld seams with color match weld rod (WR1)

1. SECTION 09 65 16, WELDING RODS

Finish Code	Manufacturer	Pattern/Color
WR1	Tarkett Johnsonite	1287830, color to match RSF1

2. SECTION 09 65 16, CAP STRIPS				
Finish Code	Manufacturer	Product	Pattern/Color	Notes
CS1	Tarkett Johnsonite	Cove Cap, SCC-XX-A	#80 Fawn	Use with RSF1. Install at top of integral cove base (ICB).

F. SECTION 09 65 13, RESILIENT BASE AND ACCESSORIES

Finish Code	Description	Manufacturer	Product Name	Pattern/Color	Height	Notes
RA1	Resilient Transition Strip	Tarkett Johnsonite	CRS-XX-A	#283 Toast		
RA2	Resilient Transition Strip	Tarkett Johnsonite	CTA-XX-3	#63 Burnt Umber		
RB1	Vinyl Base	Tarkett Johnsonite	Traditional wall base, continuous roll	#283 Toast	4 inch	Install toe-less at carpet tile. Install toe at resilient flooring and where ICB is not specified, typical.

G. SECTION 09 68 00, CARPET

Finish Code	Manufacturer	Product Name	Pattern/Color
CPT1	Mannington	Valley Fold	75390 Rooster
CPT2	Tarkett	04849 Maelstrom	33212 Terra Firma
MAT1	Mannington	Inertia	14362 Vector

1. SECTION 09 68 00, CARPET EDGE STRIP					
Finish Code	Material	Manufacturer	Product	Color Name/No.	Notes
ES1	Metal	Schluter	Schiene	Finish: Satin Anodized Aluminum	Install at carpet to luxury vinyl tile conditions at Waiting.

H. SECTION 09 68 00, CARPET MODULES

Finish Code	Size	Installation Method	Manufacturer	Color Name/No.
CPT1	24" x 24" (610 mm x 610 mm)	Monolithic	Mannington	75390 Rooster
CPT2	24" x 24" (610 mm x 610 mm)	Vertical Ashlar	Tarkett	33212 Terra Firma
MAT1	18" x 36" (457 mm x 914 mm)	Horizontal Brick Ashlar	Mannington	14362 Vector

I. SECTION 09 91 00, PAINT AND COATINGS

1. MPI Gloss and Sheen Standards

Gloss @60

Sheen @85

CONSTRUCT PRIMARY CARE / MENTAL HEALTH BUILDING
BOISE VA MEDICAL CENTER – BOISE, ID

PROJECT #: 531-325
CONSTRUCTION DOCUMENTS

Gloss Level 1	a traditional matte finish-flat	max 5 units, and	max 10 units
Gloss Level 2	a high side sheen flat-“a velvet-like” finish	max 10 units, and	10-35 units
Gloss Level 3	a traditional “egg-shell like” finish	10-25 units, and	10-35 units
Gloss Level 4	a “satin-like” finish	20-35 units, and	min. 35 units
Gloss Level 5	a traditional semi-gloss	35-70 units	
Gloss Level 6	a traditional gloss	70-85 units	
Gloss level 7	a high gloss	more than 85 units	

2. Paint Code	Description	Gloss	Manufacturer	Product Name	Color Name/No.
P1	Field Paint	Eggshell	Sherwin Williams	Harmony Low VOC	SW6385 Dover White
P2	Accent Paint, Light Blue/Gray	Eggshell	Sherwin Williams	Harmony Low VOC	SW6234 Uncertain Gray
P3	Accent Paint, Brown	Eggshell	Sherwin Williams	Harmony Low VOC	SW0038 Library Pewter
P4	Accent Paint, Light Gray	Eggshell	Sherwin Williams	Harmony Low VOC	SW7017 Dorian Gray
P5	Accent Paint, Navy	Eggshell	Sherwin Williams	Harmony Low VOC	SW0032 Needlepoint Navy
P6	Accent Paint, Tan	Eggshell	Sherwin Williams	Harmony Low VOC	SW6142 Macadamia

P7	Door Frames	Semi-Gloss	Sherwin Williams	Pro Industrial DTM Waterborne Acrylic	SW6385 Dover White
P8	Gyp Bd Ceilings & Soffit	Flat	Sherwin Williams	Harmony Low VOC	SW7757 High Reflective White
P9	White Paint	Eggshell	Sherwin Williams	Harmony Low VOC	SW7757 High Reflective White
EP1	Light Neutral	Semi-gloss	Sherwin Williams	Pro Industrial Pre-Catalyzed Waterbased Epoxy	SW6385 Dover White
EP2	Light Blue/Gray	Semi-gloss	Sherwin Williams	Pro Industrial Pre-Catalyzed Waterbased Epoxy	SW6234 Uncertain Gray

J. SECTION 09 72 16, VINYL COATED FABRIC WALLCOVERING

Finish Code	Description	Manufacturer	Product Name	Color Name/No.
WC1	Digitally Printed Wall Covering Mural	Koroseal	Digital Lab Custom Wallcovering, Material: Type II Vinyl	Custom Image from Brand: Kurt Johnson of one of the following areas in Idaho: (Redfish Lake, Sawtooth Mountains, Owyhee Desert, Snake River) or acceptable alternate
WC2	Digitally Printed Wall Covering Mural	Koroseal	Digital Lab Custom Wallcovering, Material: Type II Vinyl	Custom Image from Brand: Kurt Johnson of one of the following areas in Idaho: (Redfish Lake, Sawtooth Mountains, Owyhee Desert, Snake River) or acceptable alternate

WC3	Digitally Printed Wall Covering Mural	Koroseal	Digital Lab Custom Wallcovering, Material: Type II Vinyl	Custom Image from Brand: Kurt Johnson of one of the following areas in Idaho: (Redfish Lake, Sawtooth Mountains, Owyhee Desert, Snake River) or acceptable alternate
WC4	Digitally Printed Wall Covering Mural	Koroseal	Digital Lab Custom Wallcovering, Material: Type II Vinyl	Custom Image from Brand: Kurt Johnson of one of the following areas in Idaho: (Redfish Lake, Sawtooth Mountains, Owyhee Desert, Snake River) or acceptable alternate

2.10 DIVISION 10 - SPECIALTIES

A. SECTION 10 26 00, WALL GUARDS AND CORNER GUARDS

Finish Code	Item	Product	Manufacturer	Pattern/Color	Size	Notes
CG1	Corner Guard	Korogard G200 Vinyl Corner Guard	Koroseal	Feather (4M), Texture: P1 Dune	3" legs x Wall Face x Full Height	Install at top of scheduled wall base.
CG2	Corner Guard	Korogard G200 Vinyl Corner Guard	Koroseal	Lava (TR), Texture: P1 Dune	3" legs x Wall Face x Full Height	Install at top of scheduled wall base.

RWC1	Rigid Wall Covering (Sheet Wall Protection)	Korogard Sheets	Koroseal	Feather (4M), Texture: P1 Dune	0.060" Thick Sheet; 4'-0" Tall	Install at top of scheduled wall base.
RWC2	Rigid Wall Covering (Sheet Wall Protection)	Korogard Sheets	Koroseal	Boucle (LN), Texture: P1 Dune	0.060" Thick Sheet; 4'-0" Tall	Install at top of scheduled wall base.
RWC3	Rigid Wall Covering (Sheet Wall Protection)	Korogard Sheets	Koroseal	Serene Gray (58), Texture: P1 Dune	0.060" Thick Sheet; 4'-0" Tall	Install at top of scheduled wall base.

B. SECTION 10 14 00, SIGNAGE

Sign Type	Component	Manufacturer	Mfg. Color Name/No.
IN-01.02	BACKGROUND	MATTHEWS PAINT	RED (OSHA) #MP09251
IN-01.02	TEXT		WHITE
IN-01.26	BACKGROUND	MATTHEWS PAINT	GARBO SILVER #MP02650
IN-01.26	TEXT		BLACK
IN-02.01, IN-02.02, IN-02.03, IN-02.04	BACKGROUND	MATTHEWS PAINT	NEW VA BLUE # MP09144
IN-02.01, IN-02.02, IN-02.03, IN-02.04	TEXT		WHITE

IN-02.07, IN-02.08	FRAME		POLISHED ALUMINUM
IN-02.10	BACKGROUND		WHITE
IN-02.10	GRAPHICS	MATTHEWS PAINT	NEW VA BLUE # MP09144 WITH WHITE TEXT, BLACK TEXT & IMAGE, RED (OSHA) #MP09251 NO SYMBOL
IN-04.02, IN-07.02, IN-08.02, IN-09.03, IN-09.08, IN-15.52	BACKGROUND	TAKEFORM	TRAVERTINE #LT3526
IN-04.02, IN-07.02, IN-08.02, IN-09.03, IN-09.08, IN-15.52	TEXT	TAKEFORM	CHOCOLATE BROWN #6290
IN-07.02	INDICATORS		RED, GREEN & POLISHED ALUMINUM
IN-99.01-01, IN-99.01-02	BACKER PANEL	TAKEFORM	CHOCOLATE BROWN #6290
IN-99.01-01	TOP PANEL	SHERMAN WILLIAMS	ARMAGNAC #SW6354
IN-99.01-02	TOP FRONT PANEL	SHERMAN WILLIAMS	EMPIRE GOLD #SW0012
IN-99.01-01, IN-99.01-02	BOTTOM FRONT PANEL		NO COLOR, FROSTED ACRYLIC TO REMAIN UNFINISHED
IN-99.01-01, IN-99.01-02	TEXT	TAKEFORM	CHOCOLATE BROWN #6290
PL-12.01, EN-03.05	POWDER COAT	CADINAL	STATUARY BRONZE #T026-BR340
PL-12.01, EN-03.05	TEXT		WHITE
PL-12.01	BACKGROUND		WHITE
PL-12.01	PARKING SYMBOL		GREEN
PL-12.01	HANDICAP SYMBOL	MATTHEWS PAINT	HANDICAPPED BLUE #MP26511
PL-12.04, PL-12.05	BACKGROUND	MATTHEWS PAINT	HANDICAPPED BLUE #MP26511

PL-12.04, PL-12.05	TEXT		WHITE
--------------------	------	--	-------

2.12 DIVISION 12- FURNISHINGS

A. SECTION 12 31 00, METAL CASEWORK

Item/ Type	Finish	Manufacturer	Mfg. Color Name/No.
LOCKERS	Steel	Lyon	Double Tier 12"w x 12"d x 66"h Standard Metal Locker 3 Wide

B. SECTION 12 32 00, WOOD CASEWORK

Item Type	Location	Finish/Color
Cabinets, Drawers	Exam Room, Procedure Room, Women's Health Exam, Staff Lounge, Clean Supply, Soiled Medical Equipment, Lactation	High Pressure Plastic Laminate (PLAM1)
Countertop	Exam Room, Procedure Room, Women's Health Exam, Staff Lounge, Clean Supply, Soiled Medical Equipment, Lactation	Non-porous, homogeneous solid surface (S1)

C. SECTION 12 36 00, COUNTERTOPS AND ACCESSORIES

Finish Code	Type	Manufacturer	Finish/Color
-------------	------	--------------	--------------

S1	Homogeneous solid surface	Corian	Aurora
QZ1	Quartz	WilsonArt	Isselburg Q4013

PART III EXECUTION

3.1 FINISH SCHEDULES & MISCELLANEOUS ABBREVIATIONS

FINISH SCHEDULE & MISCELLANEOUS ABBREVIATIONS	
Term	Abbreviation
Acoustic Ceiling Cloud	ACC
Access Flooring	AF
Accordion Folding Partition	AFP
Acoustical Ceiling	AT
Acoustical Ceiling, Special Faced	AT (SP)
Acoustical Metal Pan Ceiling	AMP
Acoustical Wall Panel	AWP
Acoustical Wall Treatment	AWT
Acoustical Wallcovering	AWF
Anodized Aluminum Colored	AAC
Anodized Aluminum Natural Finish	AA
Baked On Enamel	BE
Brick Face	BR
Brick Flooring	BF
Brick Paving	BP

Carpet	CP
Carpet Athletic Flooring	CAF
Carpet Mat (Walk-Off)	MAT
Carpet Module Tile	CPT
Ceramic Glazed Facing Brick	CGFB
Ceramic Mosaic Tile	FTCT
Concrete	C
Concrete Masonry Unit	CMU
Decorative Wood Panel	DWP
Divider Strips Marble	DS MB
Epoxy Coating	EC
Epoxy Resin Flooring	ERF
Existing	E
Epoxy Paint	EP
Exposed Divider Strips	EXP
Exterior	EXT
Exterior Finish System	EFS
Exterior Paint	EXT-P
Exterior Stain	EXT-ST
Fabric Wallcovering	WF
Facing Tile	SCT
Feature Strips	FS

CONSTRUCT PRIMARY CARE / MENTAL HEALTH BUILDING
BOISE VA MEDICAL CENTER – BOISE, ID

PROJECT #: 531-325
CONSTRUCTION DOCUMENTS

Floor Mats & Frames	FM
Floor Tile, Mosaic	FT
Fluorocarbon	FC
Folding Panel Partition	FP
Foot Grille	FG
Glass Masonry Unit	GUMU
Glazed Face CMU	GCMU
Glazed Structural Facing Tile	SFTU
Granite	GT
Gypsum Wallboard	GWB
High Glazed Coating	SC
Latex Mastic Flooring	LM
Linear Metal Ceiling	LMC
Linear Wood Ceiling	LWC
Marble	MB
Mortar	M
Multi-Color Coating	MC
Natural Finish	NF
Paint	P
Porcelain Tile (Floor & Base)	PT
Perforated Metal Facing (Tile or Panels)	PMF
Plaster	PL
Plaster High Strength	HSPL
Plaster Keene Cement	KC
Plastic Laminate	PLAM
Polypropylene Fabric Wallcovering	PFW
Porcelain Paver Tile	PPT
Quarry Tile	QT

Stone, (Quartz)	QZ
Radiant Ceiling Panel System	RCP
Resilient Sheet Flooring	RSF
Resilient Stair Tread	RST
Resilient Tile Flooring	LVT
Resilient Base	RB
Rigid Wall Covering (Sheet Wall Protection)	RWC
Rubber Tile Flooring	RT
Solid Surface	S
Spandrel Glass	SLG
Stain	ST
Stainless Steel	SST
Stone Flooring	SF
Structural Clay	SC
Suspension Decorative Grids	SDG
Terrazzo Portland Cement	PCT
Terrazzo Tile	TT
Terrazzo, Thin Set	TST
Textured Gypsum Ceiling Panel	TGC
Textured Metal Ceiling Panel	TMC
Veneer Plaster	VP
Vinyl Coated Fabric Wallcovering	VWC
Vinyl Composition Tile	VCT
Vinyl Sheet Flooring (Welded Seams)	WSF

Wall Border	WB
Wood	WD

3.2 FINISH SCHEDULE SYMBOLS

Symbol Definition

**	Same finish as adjoining walls
-	No color required
E	Existing
XX	To match existing
EFTR	Existing finish to remain
RM	Remove

--- E N D---

SECTION 09 22 16
NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies steel studs wall systems, shaft wall systems, ceiling or soffit suspended or furred framing, wall furring, fasteners, and accessories for the screw attachment of gypsum board, plaster bases or other building boards.

1.2 RELATED WORK

- A. Load bearing framing: Section 05 40 00, COLD-FORMED METAL FRAMING.
- B. Support for wall mounted items: Section 05 50 00, METAL FABRICATIONS.
- C. Pull down tabs in steel decking: Section 05 36 00, COMPOSITE METAL DECKING.
- D. Ceiling suspension systems for acoustical tile or panels and lay in gypsum board panels:
Section 09 51 00, ACOUSTICAL CEILINGS Section 09 29 00, GYPSUM BOARD.

1.3 TERMINOLOGY

- A. Description of terms shall be in accordance with ASTM C754, ASTM C11, ASTM C841 and as specified.
- B. Underside of Structure Overhead: In spaces where steel trusses or bar joists are shown, the underside of structure overhead shall be the underside of the floor or roof construction supported by beams, trusses, or bar joists. In interstitial spaces with walk-on floors the underside of the walk-on floor is the underside of structure overhead.
- C. Thickness of steel specified is the minimum bare (uncoated) steel thickness.

1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data:
 - 1. Studs, runners and accessories.
 - 2. Hanger inserts.
 - 3. Channels (Rolled steel).

4. Furring channels.
5. Screws, clips and other fasteners.
- C. Shop Drawings:
 1. Typical ceiling suspension system.
 2. Typical metal stud and furring construction system including details around openings and corner details.
 3. Typical shaft wall assembly
 4. Typical fire rated assembly and column fireproofing showing details of construction same as that used in fire rating test.
- D. Test Results: Fire rating test designation, each fire rating required for each assembly.

1.5 DELIVERY, IDENTIFICATION, HANDLING AND STORAGE

In accordance with the requirements of ASTM C754.

1.6 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced.
The publications are referenced in the text by the basic designation only.
- B. American Society For Testing And Materials (ASTM)
 - A641-09.....Zinc-Coated (Galvanized) Carbon Steel Wire
 - A653/653M-11.....Specification for Steel Sheet, Zinc Coated (Galvanized) or
Zinc-Iron Alloy-Coated (Galvannealed) by Hot-Dip Process.
 - C11-10.....Terminology Relating to Gypsum and Related Building
Materials and Systems
 - C635-07.....Manufacture, Performance, and Testing of Metal
Suspension System for Acoustical Tile and Lay-in Panel
Ceilings
 - C636-08.....Installation of Metal Ceiling Suspension Systems for
Acoustical Tile and Lay-in Panels
 - C645-09.....Non-Structural Steel Framing Members
 - C754-11.....Installation of Steel Framing Members to Receive Screw-
Attached Gypsum Panel Products

- C841-03(R2008)Installation of Interior Lathing and Furring
- C954-10Steel 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
- E580-11Application of Ceiling Suspension Systems for Acoustical
Tile and Lay-in Panels in Areas Requiring Moderate Seismic
Restraint.

PART 2 - PRODUCTS

2.1 PROTECTIVE COATING

Galvanize steel studs, runners (track), rigid (hat section) furring channels, "Z" shaped furring channels, and resilient furring channels, with coating designation of G40 or equivalent.

2.2 STEEL STUDS AND RUNNERS (TRACK)

- A. ASTM C645, modified for thickness specified and sizes as shown.
 - 1. Use C 645 steel, 0.75 mm (0.0296-inch) minimum base-metal (30 mil).
 - 2. Runners same thickness as studs.
 - 3. Exception: Members that can show certified third-party testing with gypsum board in accordance with ICC ES AC86 (Approved May 2012) need not meet the minimum thickness limitation or minimum section properties set forth in ASTM C 645. The submission of an evaluation report is acceptable to show conformance to this requirement. Use C 645 steel, 0.48mm (0.019 inch) minimum base-metal (19 mil).
- B. Provide not less than two cutouts in web of each stud, approximately 300 mm (12 inches) from each end, and intermediate cutouts on approximately 600 mm (24-inch) centers.
- C. Doubled studs for openings and studs for supporting concrete backer-board.
- D. Studs 3600 mm (12 feet) or less in length shall be in one piece.
- E. Shaft Wall Framing:
 - 1. Conform to rated wall construction.

2. C-H Studs or C-T Studs.
3. E Studs.
4. J Runners.
5. Steel Jamb-Strut.

2.3 FURRING CHANNELS

- A. Rigid furring channels (hat shape): ASTM C645.
- B. Resilient furring channels:
 1. Not less than 0.45 mm (0.0179-inch) thick bare metal.
 2. Semi-hat shape, only one flange for anchorage with channel web leg slotted on anchorage side, channel web leg on other side stiffens fastener surface but shall not contact anchorage surface other channel leg is attached to.
- C. "Z" Furring Channels:
 1. Not less than 0.45 mm (0.0179-inch)-thick base metal, with 32 mm (1-1/4 inch) and 19 mm (3/4-inch) flanges.
 2. Web furring depth to suit thickness of insulation.
- D. Rolled Steel Channels: ASTM C754, cold rolled; or, ASTM C841, cold rolled.

2.4 FASTENERS, CLIPS, AND OTHER METAL ACCESSORIES

- A. ASTM C754, except as otherwise specified.
- B. For fire rated construction: Type and size same as used in fire rating test.
- C. Fasteners for steel studs thicker than 0.84 mm (0.033-inch) thick. Use ASTM C954 steel drill screws of size and type recommended by the manufacturer of the material being fastened.
- D. Clips: ASTM C841 (paragraph 6.11), manufacturer's standard items. Clips used in lieu of tie wire shall have holding power equivalent to that provided by the tie wire for the specific application.
- E. Concrete ceiling hanger inserts (anchorage for hanger wire and hanger straps): Steel, zinc-coated (galvanized), manufacturers standard items, designed to support twice the hanger loads imposed and the type of hanger used.

F. Tie Wire and Hanger Wire:

1. ASTM A641, soft temper, Class 1 coating.
2. Gage (diameter) as specified in ASTM C754 or ASTM C841.

G. Attachments for Wall Furring:

1. Manufacturers standard items fabricated from zinc-coated (galvanized) steel sheet.
2. For concrete or masonry walls: Metal slots with adjustable inserts or adjustable wall furring brackets. Spacers may be fabricated from 1 mm (0.0396-inch) thick galvanized steel with corrugated edges.

H. Power Actuated Fasteners: Type and size as recommended by the manufacturer of the material being fastened.

2.5 SUSPENDED CEILING SYSTEM FOR GYPSUM BOARD (OPTION)

- A. Conform to ASTM C635, heavy duty, with not less than 35 mm (1-3/8 inch) wide knurled capped flange face designed for screw attachment of gypsum board.
- B. Wall track channel with 35 mm (1-3/8 inch) wide flange.

PART 3 - EXECUTION

3.1 INSTALLATION CRITERIA

- A. Where fire rated construction is required for walls, partitions, columns, beams and floor-ceiling assemblies, the construction shall be same as that used in fire rating test.
- B. Construction requirements for fire rated assemblies and materials shall be as shown and specified, the provisions of the Scope paragraph (1.2) of ASTM C754 and ASTM C841 regarding details of construction shall not apply.

3.2 INSTALLING STUDS

- A. Install studs in accordance with ASTM C754, except as otherwise shown or specified.
- B. Space studs not more than (16 inches) on center.
- C. Cut studs 6 mm to 9 mm (1/4 to 3/8-inch) less than floor to underside of structure overhead when extended to underside of structure overhead.
- D. Where studs are shown to terminate above suspended ceilings, provide bracing as shown or extend studs to underside of structure overhead.

- E. Extend studs to underside of structure overhead for fire, rated partitions, smoke partitions, shafts, and sound rated partitions and insulated exterior wall furring.
- G. Openings:
 - 1. Frame jambs of openings in stud partitions and furring with two studs placed back to back or as shown.
 - 2. Fasten back to back studs together with 9 mm (3/8-inch) long Type S pan head screws at not less than 600 mm (two feet) on center, staggered along webs.
 - 3. Studs fastened flange to flange shall have splice plates on both sides approximately 50 X 75 mm (2 by 3 inches) screwed to each stud with two screws in each stud. Locate splice plates at 600 mm (24 inches) on center between runner tracks.
- H. Fastening Studs:
 - 1. Fasten studs located adjacent to partition intersections, corners and studs at jambs of openings to flange of runner tracks with two screws through each end of each stud and flange of runner.
 - 2. Do not fasten studs to top runner track when studs extend to underside of structure overhead.
- I. Chase Wall Partitions:
 - 1. Locate cross braces for chase wall partitions to permit the installation of pipes, conduits, carriers and similar items.
 - 2. Use studs or runners as cross bracing not less than 63 mm (2-1/2 inches wide).
- J. Form building seismic or expansion joints with double studs back to back spaced 75 mm (three inches) apart plus the width of the seismic or expansion joint.
- K. Form control joint, with double studs spaced 13 mm (1/2-inch) apart.

3.3 INSTALLING WALL FURRING FOR FINISH APPLIED TO ONE SIDE ONLY

- A. In accordance with ASTM C754, or ASTM C841 except as otherwise specified or shown.
- B. Wall furring-Stud System:
 - 1. Framed with 63 mm (2-1/2 inch) or narrower studs, (16 inches) on center.

2. Brace as specified in ASTM C754 for Wall Furring-Stud System or brace with sections or runners or studs placed horizontally at not less than three foot vertical intervals on side without finish.
 3. Securely fasten braces to each stud with two Type S pan head screws at each bearing.
- C. Direct attachment to masonry or concrete; rigid channels or "Z" channels:
1. Install rigid (hat section) furring channels at 600 mm (24 inches) on center, horizontally or vertically.
 2. Install "Z" furring channels vertically spaced not more than 600 mm (24 inches) on center.
 3. At corners where rigid furring channels are positioned horizontally, provide mitered joints in furring channels.
 4. Ends of spliced furring channels shall be nested not less than 200 mm (8 inches).
 5. Fasten furring channels to walls with power-actuated drive pins or hardened steel concrete nails. Where channels are spliced, provide two fasteners in each flange.
 6. Locate furring channels at interior and exterior corners in accordance with wall finish material manufacturers printed erection instructions. Locate "Z" channels within 100 mm (4 inches) of corner.
- D. Installing Wall Furring-Bracket System: Space furring channels not more than 400 mm (16 inches) on center.

3.4 INSTALLING SUPPORTS REQUIRED BY OTHER TRADES

- A. Provide for attachment and support of electrical outlets, plumbing, laboratory or heating fixtures, recessed type plumbing fixture accessories, access panel frames, wall bumpers, wood seats, toilet stall partitions, dressing booth partitions, urinal screens, chalkboards, tackboards, wall-hung casework, handrail brackets, recessed fire extinguisher cabinets and other items like auto door buttons and auto door operators supported by stud construction.
- B. Provide additional studs where required. Install metal backing plates, or special metal shapes as required, securely fastened to metal studs.

3.5 INSTALLING SHAFT WALL SYSTEM

- A. Conform to UL Design No. U438 for two-hour fire rating.
- B. Position J runners at floor and ceiling with the short leg toward finish side of wall.
Securely attach runners to structural supports with power driven fasteners at both ends and 600 mm (24 inches) on center.
- C. After liner panels have been erected, cut C-H studs and E studs, from 9 mm (3/8-inch) to not more than 13 mm (1/2-inch) less than floor-to-ceiling height. Install C-H studs between liner panels with liner panels inserted in the groove.
- D. Install full-length steel E studs over shaft wall line at intersections, corners, hinged door jambs, columns, and both sides of closure panels.
- E. Suitably frame all openings to maintain structural support for wall:
 - 1. Provide necessary liner fillers and shims to conform to label frame requirements.
 - 2. Frame openings cut within a liner panel with E studs around perimeter.
 - 3. Frame openings with vertical E studs at jambs, horizontal J runner at head and sill.
- F. Elevator Shafts:
 - 1. Frame elevator door frames with 0.87 mm (0.0341-inch) thick J strut or J stud jambs having 75 mm (three-inch) long legs on the shaft side.
 - 2. Protrusions including fasteners other than flange of shaft wall framing system or offsets from vertical alignments more than 3 mm (1/8-inch) are not permitted unless shown.
 - 3. Align shaft walls for plumb vertical flush alignment from top to bottom of shaft.

3.6 INSTALLING FURRED AND SUSPENDED CEILINGS OR SOFFITS

- A. Install furred and suspended ceilings or soffits in accordance with ASTM C754 or ASTM C841 except as otherwise specified or shown for screw attached gypsum board ceilings and for plaster ceilings or soffits.
 - 1. Space framing at 400 mm (16-inch) centers for metal lath anchorage.
 - 2. Space framing at 400 mm (16-inch) centers for gypsum board anchorage.
- B. New exposed concrete slabs:

1. Use metal inserts required for attachment and support of hangers or hanger wires with tied wire loops for embedding in concrete.
 2. Furnish for installation under Division 3, CONCRETE.
 3. Suspended ceilings under concrete rib construction shall have runner channels at right angles to ribs and be supported from ribs with hangers at ends and at 1200 mm (48-inch) maximum intervals along channels. Stagger hangers at alternate channels.
- C. Concrete slabs on steel decking composite construction:
1. Use pull down tabs when available.
 2. Use power activated fasteners when direct attachment to structural framing can not be accomplished.
- D. Where bar joists or beams are more than 1200 mm (48 inches) apart, provide intermediate hangers so that spacing between supports does not exceed 1200 mm (48 inches). Use clips, bolts, or wire ties for direct attachment to steel framing.
- F. Steel decking without concrete topping:
1. Do not fasten to steel decking 0.76 mm (0.0299-inch) or thinner.
 2. Toggle bolt to decking 0.9 mm (0.0359-inch) or thicker only where anchorage to steel framing is not possible.
- G. Installing suspended ceiling system for gypsum board (ASTM C635 Option):
1. Install only for ceilings to receive screw attached gypsum board.
 2. Install in accordance with ASTM C636.
 - a. Install main runners spaced 1200 mm (48 inches) on center.
 - b. Install 1200 mm (four foot) tees not over 600 mm (24 inches) on center; locate for edge support of gypsum board.
 - c. Install wall track channel at perimeter.
- H. Installing Ceiling Bracing System:
1. Construct bracing of 38 mm (1-1/2 inch) channels for lengths up to 2400 mm (8 feet) and 50 mm (2 inch) channels for lengths over 2400 mm (8 feet) with ends bent to form surfaces for anchorage to carrying channels and over head construction. Lap

channels not less than 600 mm (2 feet) at midpoint back to back. Screw or bolt lap together with two fasteners.

2. Install bracing at an approximate 45 degree angle to carrying channels and structure overhead; secure as specified to structure overhead with two fasteners and to carrying channels with two fasteners or wire ties.
3. Brace suspended ceiling or soffit framing in seismic areas in accordance with ASTM E580.

3.7 TOLERANCES

- A. Fastening surface for application of subsequent materials shall not vary more than 3 mm (1/8-inch) from the layout line.
- B. Plumb and align vertical members within 3 mm (1/8-inch.)
- C. Level or align ceilings within 3 mm (1/8-inch.)

--- E N D ---

**SECTION 09 29 00
GYPSUM BOARD**

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies installation and finishing of gypsum board.

1.2 RELATED WORK

- A. Installation of steel framing members for walls, partitions, furring, soffits, and ceilings:
Section 05 40 00, COLD-FORMED METAL FRAMING, and Section 09 22 16, NON-STRUCTURAL METAL FRAMING.
- B. Sound deadening board: Section 07 21 13, THERMAL INSULATION.
- C. Acoustical Sealants: Section 07 92 00, JOINT SEALANTS.
- D. Gypsum base for veneer plaster: Section 09 26 00, VENEER PLASTERING.
- E. Lead lined wallboard: Section 13 49 00, RADIATION PROTECTION.
- F. Lay in gypsum board ceiling panels: Section 09 51 00, ACOUSTICAL CEILING.

1.3 TERMINOLOGY

- A. Definitions and description of terms shall be in accordance with ASTM C11, C840, and as specified.
- B. Underside of Structure Overhead: In spaces where steel trusses or bar joists are shown, the underside of structure overhead shall be the underside of the floor or roof construction supported by the trusses or bar joists.
- C. "Yoked": Gypsum board cut out for opening with no joint at the opening (along door jamb or above the door).

1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data:
 - 1. Cornerbead and edge trim.
 - 2. Finishing materials.
 - 3. Laminating adhesive.

4. Gypsum board, each type.

C. Shop Drawings:

1. Typical gypsum board installation, showing corner details, edge trim details and the like.
2. Typical sound rated assembly, showing treatment at perimeter of partitions and penetrations at gypsum board.
3. Typical shaft wall assembly.
4. Typical fire rated assembly and column fireproofing, indicating details of construction same as that used in fire rating test.

D. Samples:

1. Cornerbead.
2. Edge trim.
3. Control joints.

E. Test Results:

1. Fire rating test, each fire rating required for each assembly.
2. Sound rating test.

F. Certificates: Certify that gypsum board types, gypsum backing board types, cementitious backer units, and joint treating materials do not contain asbestos material.

1.5 DELIVERY, IDENTIFICATION, HANDLING AND STORAGE

In accordance with the requirements of ASTM C840.

1.6 ENVIRONMENTAL CONDITIONS

In accordance with the requirements of ASTM C840.

1.7 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced.

The publications are referenced in the text by the basic designation only.

- B. American Society for Testing And Materials (ASTM):

C11-15Terminology Relating to Gypsum and Related Building
Materials and Systems

- C475-15Joint Compound and Joint Tape for Finishing Gypsum Board
- C840-13Application and Finishing of Gypsum Board
- C919-12Sealants in Acoustical Applications
- C954-15Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases to Steel Stud from 0.033 in. (0.84mm) to 0.112 in. (2.84mm) in thickness
- C1002-14Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs
- C1047-14Accessories for Gypsum Wallboard and Gypsum Veneer Base
- C1177-13Glass Mat Gypsum Substrate for Use as Sheathing
- C1178/C1178M-18.....Specification for Coated Glass Mat Water Resistant Backing Panel
- C1658-13Glass Mat Gypsum Panels
- C1396-14Gypsum Board
- C. Underwriters Laboratories Inc. (UL):
Latest EditionFire Resistance Directory
- D. Inchcape Testing Services (ITS):
Latest Editions.....Certification Listings

PART 2 - PRODUCTS

2.1 GYPSUM BOARD

- A. Gypsum Board: ASTM C1396, Type X, 16 mm (5/8 inch) thick unless shown otherwise.
- B. Coreboard or Shaft Wall Liner Panels.
 - 1. ASTM C1396, Type X.
 - 2. ASTM C1658: Glass Mat Gypsum Panels,
 - 3. Coreboard for shaft walls 300, 400, 600 mm (12, 16, or 24 inches) wide by required lengths 25 mm (one inch) thick with paper faces treated to resist moisture.

- C. Water Resistant Gypsum Backing Board: ASTM C1178, Type X, 16 mm (5/8 inch) thick.
- D. Paper facings shall contain 100 percent post-consumer recycled paper content.

2.2 GYPSUM SHEATHING BOARD

- A. ASTM C1396, Type X, water-resistant core, 16 mm (5/8 inch) thick.
- B. ASTM C1177, Type X.

2.3 ACCESSORIES

- A. ASTM C1047, except form of 0.39 mm (0.015 inch) thick zinc coated steel sheet or rigid PVC plastic.
- B. Flanges not less than 22 mm (7/8 inch) wide with punchouts or deformations as required to provide compound bond.

2.4 FASTENERS

- A. ASTM C1002 and ASTM C840, except as otherwise specified.
- B. ASTM C954, for steel studs thicker than 0.04 mm (0.33 inch).
- C. Select screws of size and type recommended by the manufacturer of the material being fastened.
- D. For fire rated construction, type and size same as used in fire rating test.
- E. Clips: Zinc-coated (galvanized) steel; gypsum board manufacturer's standard items.

2.5 FINISHING MATERIALS AND LAMINATING ADHESIVE

ASTM C475 and ASTM C840. Free of antifreeze, vinyl adhesives, preservatives, biocides and other VOC. Adhesive shall contain a maximum VOC content of 50 g/l.

PART 3 - EXECUTION

3.1 GYPSUM BOARD HEIGHTS

- A. Extend all layers of gypsum board from floor to underside of structure overhead on following partitions and furring:
 - 1. Two sides of partitions:
 - a. Fire rated partitions.
 - b. Smoke partitions.
 - c. Sound rated partitions.
 - d. Full height partitions shown (FHP).

2. One side of partitions or furring:
 - a. Inside of exterior wall furring or stud construction.
 - b. Room side of room without suspended ceilings.
 - c. Furring for pipes and duct shafts, except where fire rated shaft wall construction is shown.
 - d. Corridor partitions.
3. Extend all layers of gypsum board construction used for fireproofing of columns from floor to underside of structure overhead, unless shown otherwise.
- B. In locations other than those specified, extend gypsum board from floor to heights as follows:
 1. Not less than 100 mm (4 inches) above suspended acoustical ceilings.
 2. At ceiling of suspended gypsum board ceilings.
 3. At existing ceilings.

3.2 INSTALLING GYPSUM BOARD

- A. Coordinate installation of gypsum board with other trades and related work.
- B. Install gypsum board in accordance with ASTM C840, except as otherwise specified.
- C. Moisture and Mold-Resistant Assemblies: Provide and install moisture and mold-resistant glass mat gypsum wallboard products with moisture-resistant surfaces complying with ASTM C1658 where shown and in locations which might be subject to moisture exposure during construction.
- D. Use gypsum boards in maximum practical lengths to minimize number of end joints.
- E. Bring gypsum board into contact, but do not force into place.
- F. Ceilings:
 1. For single-ply construction, use perpendicular application.
 2. For two-ply assemblies:
 - a. Use perpendicular application.
 - b. Apply face ply of gypsum board so that joints of face ply do not occur at joints of base ply with joints over framing members.

G. Walls (Except Shaft Walls):

1. When gypsum board is installed parallel to framing members, space fasteners 300 mm (12 inches) on center in field of the board, and 200 mm (8 inches) on center along edges.
2. When gypsum board is installed perpendicular to framing members, space fasteners 300 mm (12 inches) on center in field and along edges.
3. Stagger screws on abutting edges or ends.
4. For single-ply construction, apply gypsum board with long dimension either parallel or perpendicular to framing members as required to minimize number of joints except gypsum board shall be applied vertically over "Z" furring channels.
5. For two-ply gypsum board assemblies, apply base ply of gypsum board to assure minimum number of joints in face layer. Apply face ply of wallboard to base ply so that joints of face ply do not occur at joints of base ply with joints over framing members.
6. For three-ply gypsum board assemblies, apply plies in same manner as for two-ply assemblies, except that heads of fasteners need only be driven flush with surface for first and second plies. Apply third ply of wallboard in same manner as second ply of two-ply assembly, except use fasteners of sufficient length enough to have the same penetration into framing members as required for two-ply assemblies.
7. No offset in exposed face of walls and partitions will be permitted because of single-ply and two-ply or three-ply application requirements.
8. Installing Two Layer Assembly Over Sound Deadening Board:
 - a. Apply face layer of wallboard vertically with joints staggered from joints in sound deadening board over framing members.
 - b. Fasten face layer with screw, of sufficient length to secure to framing, spaced 300 mm (12 inches) on center around perimeter, and 400 mm (16 inches) on center in the field.
9. Control Joints ASTM C840 and as follows:

- a. Locate at both side jambs of openings if gypsum board is not "yoked". Use one system throughout.
- b. Not required for wall lengths less than 9000 mm (30 feet).
- c. Extend control joints the full height of the wall or length of soffit/ceiling membrane.

H. Acoustical or Sound Rated Partitions, Fire and Smoke Partitions:

1. Cut gypsum board for a space approximately 3 mm to 6 mm (1/8 to 1/4 inch) wide around partition perimeter.
2. Coordinate for application of caulking or sealants to space prior to taping and finishing.
3. For sound rated partitions, use sealing compound (ASTM C919) to fill the annular spaces between all receptacle boxes and the partition finish material through which the boxes protrude to seal all holes and/or openings on the back and sides of the boxes. STC minimum values as shown.

I. Electrical and Telecommunications Boxes:

1. Seal annular spaces between electrical and telecommunications receptacle boxes and gypsum board partitions.

J. Accessories:

1. Set accessories plumb, level and true to line, neatly mitered at corners and intersections, and securely attach to supporting surfaces as specified.
2. Install in one piece, without the limits of the longest commercially available lengths.
3. Corner Beads:
 - a. Install at all vertical and horizontal external corners and where shown.
 - b. Use screws only. Do not use crimping tool.
4. Edge Trim (casings Beads):
 - a. At both sides of expansion and control joints unless shown otherwise.
 - b. Where gypsum board terminates against dissimilar materials and at perimeter of openings, except where covered by flanges, casings or permanently built-in equipment.

- c. Where gypsum board surfaces of non-load bearing assemblies abut load bearing members.
- d. Where shown.

3.3 INSTALLING GYPSUM SHEATHING

- A. Install in accordance with ASTM C840, except as otherwise specified or shown.
- B. Use screws of sufficient length to secure sheathing to framing.
- C. Space screws 9 mm (3/8 inch) from ends and edges of sheathing and 200 mm (8 inches) on center. Space screws a maximum of 200 mm (8 inches) on center on intermediate framing members.
- D. Apply 600 mm by 2400 mm (2 foot by 8 foot) sheathing boards horizontally with tongue edge up.
- E. Apply 1200 mm by 2400 mm or 2700 mm (4 ft. by 8 ft. or 9 foot) gypsum sheathing boards vertically with edges over framing.

3.4 CAVITY SHAFT WALL

- A. Coordinate assembly with Section 09 22 16, NON-STRUCTURAL METAL FRAMING, for erection of framing and gypsum board.
- B. Conform to UL Design No. U438 or FM WALL CONSTRUCTION 12-2/HR (Nonbearing for two-hour fire rating).
- C. Cut coreboard (liner) panels 25 mm (one inch) less than floor-to-ceiling height, and erect vertically between J-runners on shaft side.
 - 1. Where shaft walls exceed 4300 mm (14 feet) in height, position panel end joints within upper and lower third points of wall.
 - 2. Stagger joints top and bottom in adjacent panels.
 - 3. After erection of J-struts of opening frames, fasten panels to J-struts with screws of sufficient length to secure to framing staggered from those in base, spaced 300 mm (12 inches) on center.

D. Gypsum Board:

1. Two hour wall:
 - a. Erect base layer (backing board) vertically on finish side of wall with end joints staggered. Fasten base layer panels to studs with 25 mm (one inch) long screws, spaced 600 mm (24 inches) on center.
 - b. Use laminating adhesive between plies in accordance with UL or FM if required by fire test.
 - c. Apply face layer of gypsum board required by fire test vertically over base layer with joints staggered and attach with screws of sufficient length to secure to framing staggered from those in base, spaced 300 mm (12 inches) on center.
2. One hour wall with one layer on finish side of wall: Apply face layer of gypsum board vertically. Attach to studs with screws of sufficient length to secure to framing, spaced 300 mm (12 inches) on center in field and along edges.
3. Where coreboard is covered with face layer of gypsum board, stagger joints of face layer from those in the coreboard base.

E. Treat joints, corners, and fasteners in face layer as specified for finishing of gypsum board.

F. Elevator Shafts:

1. Protrusions including fasteners other than flange of shaft wall framing system or offsets from vertical alignments more than 3 mm (1/8-inch) are not permitted unless shown.
2. Align shaft walls for plumb vertical flush alignment from top to bottom of shaft.

3.5 FINISHING OF GYPSUM BOARD

- A. Finish joints, edges, corners, and fastener heads in accordance with ASTM C840. Use Level 4 finish for all finished areas open to public view.
- B. Before proceeding with installation of finishing materials, assure the following:
 1. Gypsum board is fastened and held close to framing or furring.
 2. Fastening heads in gypsum board are slightly below surface in dimple formed by driving tool.

- C. Finish joints, fasteners, and all openings, including openings around penetrations, on that part of the gypsum board extending above suspended ceilings to seal surface of non decorated fire rated gypsum board construction. After the installation of hanger rods, hanger wires, supports, equipment, conduits, piping and similar work, seal remaining openings and maintain the integrity of the fire rated construction. Sanding is not required of surfaces above suspended ceilings.

3.6 REPAIRS

- A. After taping and finishing has been completed, and before decoration, repair all damaged and defective work, including nondecorated surfaces.
- B. Patch holes or openings 13 mm (1/2 inch) or less in diameter, or equivalent size, with a setting type finishing compound or patching plaster.
- C. Repair holes or openings over 13 mm (1/2 inch) diameter, or equivalent size, with 16 mm (5/8 inch) thick gypsum board secured in such a manner as to provide solid substrate equivalent to undamaged surface.
- D. Tape and refinish scratched, abraded or damaged finish surfaces including cracks and joints in non decorated surface to provide fire protection equivalent to the fire rated construction .

--- E N D ---

SECTION 09 30 13
CERAMIC/PORCELAIN TILING

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. This section specifies interior ceramic, porcelain and quarry tile, and window stools, waterproofing membranes for thin-set applications, crack isolation membranes, and tile backer board.

1.2 RELATED WORK

- A. Sustainable Design Requirements: Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.
- B. Preformed expansion joints in tile flooring: Section 07 95 13, EXPANSION JOINT COVER ASSEMBLIES.
- C. Sealing of Joints: Section 07 92 00, JOINT SEALANTS.
- D. Color, Texture, Pattern, and Size of Field Tile and Trim Shapes, and Color of Grout Specified: Section 09 06 00, SCHEDULE FOR FINISHES.
- E. Metal and Gypsum Lathing and Gypsum Plaster: Section 09 23 00, GYPSUM PLASTERING.
- F. Lathing and Portland Cement Based Plaster: Section 09 24 00, PORTLAND CEMENT PLASTERING.
- G. Metal and Resilient Edge Strips at Joints with New Resilient Flooring, and Carpeting: Section 09 65 19, RESILIENT TILE FLOORING and Section 09 68 00, CARPETING.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Sustainable Design Submittals as described below:
 - 1. Volatile organic compounds per volume as specified in PART 2 - PRODUCTS.
- C. Samples:
 - 1. Base tile, each type, each color, each size.
 - 2. Porcelain tile, each type, color, patterns and size.

3. Wall (or wainscot) tile, each color, size and pattern.
4. Trim shapes, bullnose cap and cove including bullnose cap and base pieces at internal and external corners of vertical surfaces, each type, color, and size.

D. Product Data:

1. Ceramic and porcelain tile, marked to show each type, size, and shape required.
2. Chemical resistant mortar and grout (epoxy and furan).
3. Cementitious backer unit.
4. Dry-set portland cement mortar and grout.
5. Divider strip.
6. Elastomeric membrane and bond coat.
7. Reinforcing tape.
8. Leveling compound.
9. Latex-portland cement mortar and grout.
10. Commercial portland cement grout.
11. Organic adhesive.
12. Slip resistant tile.
13. Waterproofing isolation membrane.
14. Fasteners.

E. Certification:

1. Master grade certificate, ANSI A137.1.
2. Manufacturer's certificates indicating that the following materials comply with specification requirements:
 - a. Chemical resistant mortar and grout (epoxy and furan).
 - b. Modified epoxy emulsion.
 - c. Commercial portland cement grout.
 - d. Cementitious backer unit.
 - e. Dry-set portland cement mortar and grout.
 - f. Elastomeric membrane and bond coat.
 - g. Reinforcing tape.

- h. Latex-portland cement mortar and grout.
- i. Leveling compound.
- j. Organic adhesive.
- k. Waterproof isolation membrane.
- l. Factory back mounted tile documentation for suitability for application in wet area.

F. Installer Qualifications:

- 1. Submit letter stating installer's experience.

1.4 DELIVERY AND STORAGE

- A. Deliver materials in containers with labels legible and intact and grade-seals unbroken.
- B. Store material to prevent damage or contamination.

1.5 QUALITY ASSURANCE

- A. Installers to be from a company specializing in performing installation of products specified and have a minimum of three (3) years' experience.
- B. Each type and color of tile to be provided from a single source.
- C. Each type and color of mortar, adhesive, and grout to be provided from the same source.

1.6 WARRANTY

- A. Construction Warranty: Comply with FAR clause 52.246-21, "Warranty of Construction".

1.7 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to the extent referenced.
Publications are referenced in text by basic designation only.
- B. American National Standards Institute (ANSI):
 - A10.20-06(R2011)Safe Operating Practices for Tile, Terrazzo and Marble
WorkA108/A118/A136-14 Installation of Ceramic Tile
 - A108.01-13.....Subsurfaces and Preparations by Other Trades
 - A108.02-13.....Materials, Environmental, and Workmanship
 - A108.1A-14Installation of Ceramic Tile in the Wet-Set Method with
Portland Cement Mortar

A108.1B-10.....	Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex-Portland Cement Mortar
A108.1C-10.....	Contractors 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
A108.4-09.....	Ceramic Tile with Organic Adhesives or Water Cleanable Tile-Setting Epoxy Adhesive
A108.6-10.....	Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy
A108.8-10.....	Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout
A108.10-10.....	Grout in Tilework
A108.13-10.....	Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone
A118.1-12.....	Dry-Set Portland Cement Mortar
A118.3-13.....	Chemical Resistant, Water Cleanable Tile-Setting and – Grouting Epoxy and Water Cleanable Tile-Setting Epoxy Adhesive
A118.4-12.....	Latex-Portland Cement Mortar
A118.5-10.....	Chemical Resistant Furan Mortars and Grouts
A118.6-10.....	Cement Grouts for Tile Installation
A118.7-10.....	High Performance Cement Grouts for Tile Installation
A118.9-10.....	Cementitious Backer Units
A118.10-14.....	Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation
A136.1-13.....	Organic Adhesives for Installation of Ceramic Tile
A137.1-12.....	American National Standard Specifications for Ceramic Tile

C. ASTM International (ASTM):

A666-10	Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar
A1064/A1064M-14	Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
C109/C109M-13	Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2 inch. or [50-mm] Cube Specimens)
C241/C241M-13	Abrasion Resistance of Stone Subjected to Foot Traffic
C348-14	Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars
C627-10	Evaluating Ceramic Floor Tile Installation Systems Using the Robinson-Type Floor Tester
C954-11	Steel Drill Screws for the Application of Gypsum Board on Metal Plaster Base to Steel Studs from 0.033 in (0.84 mm) to 0.112 in (2.84 mm) in thickness
C979/C979M-10	Pigments for Integrally Colored Concrete
C1002-14	Steel Self-Piercing Tapping Screws for the Application of Panel Products
C1027-09	Test Method for Determining Visible Abrasion Resistance of Glazed Ceramic Tile
C1127-01(R2009)	Standard Guide for Use of High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane with an Integral Wearing Surface
C1178/C1178M-13	Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel
C1325-14	Non-Asbestos Fiber-Mat Reinforced Cementitious Backer Units

- C1353/C1353M-09(R2013)Abrasion Resistance of Dimension Stone Subjected to Foot Traffic Using a Rotary Platform, Double-Head Abraser
- D1204-14.....Test Method for Linear Dimensional Changes of Nonrigid Thermoplastic Sheeting or Film at Elevated Temperature
- D2240-05(R2010)Test Method for Rubber Property – Durometer Hardness
- D2497-07(R2012)Tolerances for Manufactured Organic-Base Filament Single Yarns
- D3045-92(R2010)Heat Aging of Plastics Without Load
- D4397-10.....Standard Specification for Polyethylene Sheeting for Construction, Industrial and Agricultural Applications
- D5109-12.....Standard Test Methods for Copper-Clad Thermosetting Laminates for Printed Wiring Boards
- D. Code of Federal Regulation (CFR):
- 40 CFR 59Determination of Volatile Matter Content, Water Content, Density Volume Solids, and Weight Solids of Surface Coating
- E. Marble Institute of America (MIA): Design Manual III-2007
- F. Tile Council of North America, Inc. (TCNA):
- Handbook for Ceramic Tile Installation (2014)
- DCOF AcuTest-2012Dynamic Coefficient of Friction Test

PART 2 - PRODUCTS

2.1 TILE

- A. Comply with ANSI A137.1, Standard Grade, except as modified:
1. Inspection procedures listed under the Appendix of ANSI A137.1.
 2. Abrasion Resistance Classification:
 - a. Tested in accordance with values listed in Table 1, ASTM C1027.
 - b. Class V, 12000 revolutions for floors in Corridors, Kitchens, Storage including Refrigerated Rooms

- c. Class IV, 6000 revolutions for remaining areas.
- 3. Slip Resistant Tile for Floors:
 - a. Coefficient of friction, when tested in accordance with ANSI A137.1 and measured per the TCNA DCOF AcuTest.
 - 1) Equal to or greater than .42 for level interior tile floors that will be walked on when wet.
 - b. Tile Having Abrasive Grains:
 - 1) Unglazed Ceramic Mosaic Tile: Abrasive grains throughout body of the tile.
 - 2) Quarry Tile: Abrasive grains uniformly embedded in face at rate of approximately 7.5 percent of surface area.
- 4. Mosaic tile may be mounted or joined together by a resinous bonding material along tile edges.
- 5. Factory Blending: For tile with color variations, within the ranges selected during sample submittals blend tile in the factory and package so tile units taken from one (1) package show the same range in colors as those taken from other packages and match approved samples.
- B. Unglazed Ceramic Mosaic Tile: Nominal 6 mm (1/4 inch) thick with cushion edges.
- C. Glazed Wall Tile: Cushion edges, glazing.
- D. Trim Shapes:
 - 1. Conform to applicable requirements of adjoining floor and wall tile.
 - 2. Use trim shapes sizes conforming to size of adjoining field wall tile unless detailed on construction documents or specified otherwise.
- 3. Internal and External Corners:
 - a. Square internal and external corner joints are not acceptable.
 - b. External corners including edges: Use bullnose shapes.
 - c. Internal corners: Use cove shapes.
 - d. Base to floor internal corners: Use special shapes providing integral cove vertical and horizontal joint.

- e. Base to floor external corners: Use special shapes providing bullnose vertical edge with integral cove horizontal joint. Use stop at bottom of openings having bullnose return to wall.
- f. Provide cove and bullnose shapes where indicated in construction documents, and required to complete tile work.

2.2 TILE PRODUCTS

- A. Tile Type: As indicated.
 - 1. Manufacturers: Subject to compliance with requirements, provide the following:
 - a. As indicated in Section 09 06 00, SCHEDULE FOR FINISHES
 - 2. Composition: As indicated by product.
 - 3. Size: As indicated in Section 09 06 00, SCHEDULE FOR FINISHES
 - 4. Thickness: As indicated in Section 09 06 00, SCHEDULE FOR FINISHES
 - 5. Finish: As indicated in Section 09 06 00, SCHEDULE FOR FINISHES
 - 6. Tile Color and Pattern: As indicated in Section 09 06 00, SCHEDULE FOR FINISHES
 - 7. Grout Color: As indicated in Section 09 06 00, SCHEDULE FOR FINISHES

2.3 BACKER UNITS

- A. Cementitious Backer Units:
 - 1. Use in showers or wet areas.
 - 2. Conform to ASTM C1325; Type A.
 - 3. Use in maximum lengths available to minimize end to end butt joints.
- B. Glass Mat Water Resistant Backing Board:
 - 1. Use in showers or wet areas.
 - 2. Conform to ASTM C1178/C1178M.
 - 3. Use in maximum lengths available to minimize end to end butt joints.

2.3 JOINT MATERIALS FOR CEMENTITIOUS BACKER UNITS

- A. Reinforcing Tape: Vinyl coated woven glass fiber mesh tape, open weave, 50 mm (2 inches) wide. Tape with pressure sensitive adhesive backing will not be permitted.
- B. Tape Embedding Material: Latex-portland cement mortar complying with ANSI A108.01.

- C. Joint material, including reinforcing tape, and tape embedding material, are to be as specifically recommended by the backer unit manufacturer.

2.4 FASTENERS

- A. Screws for Cementitious Backer Units.
 - 1. Standard screws for gypsum board are not acceptable.
 - 2. Minimum 11 mm (7/16 inch) diameter head, corrosion resistant coated, with washers.
 - 3. ASTM C954 for steel 1 mm (0.033 inch) thick.
 - 4. ASTM C1002 for steel framing less than 0.0329 inch thick.
- B. Washers: Galvanized steel, 13 mm (1/2 inch) minimum diameter.

2.5 SETTING MATERIALS OR BOND COATS:

- A. Conform to TCNA Handbook for Ceramic Tile Installation.
- B. Portland Cement Mortar: ANSI A108.02.
- C. Latex-Portland Cement Mortar: ANSI A118.4.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide TEC Superflex Mortar or comparable product by one of the following:
 - a. Bostik, Inc.
 - b. Custom Building Products
 - c. Laticrete International, Inc.
 - d. MAPEI Corporation
 - 2. Provide prepackaged dry-mortar mix containing dry, redispersible, ethylene vinyl acetate additive; and other ingredients to which only water needs to be added at Project site.
 - 3. Provide prepackaged, dry-mortar mix combined with acrylic resin or styrene-butadiene-rubber liquid latex additive at Project site.
 - 3. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to other requirements in ANSI A118.4.
- E. Organic Adhesives: ANSI A136.1, Type 1.
- F. Chemical-Resistant Bond Coat:

1. Epoxy Resin Type: ANSI A118.3.
2. Furan Resin Type: ANSI A118.5.

2.6 GROUTING MATERIALS

- A. Polymer-Modified Tile Grout: ANSI A118.7.
 1. Manufacturers: Subject to compliance with requirements, provide Mapei Flexcolor CQ Grout color as indicated in Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Coloring Pigments:
 1. Pure mineral pigments, lime proof and nonfading, complying with ASTM C979/C979M.
 2. Coloring pigments may only be added to grout by the manufacturer.
 3. Job colored grout is not acceptable.
 4. Use is required in Commercial Portland Cement Grout, Dry-Set Grout, and Latex-Portland Cement Grout.
- B. Sand-Portland Cement Grout: ANSI A108.10, consisting of white or gray cement and white or colored aggregate as required to produce color indicated. Volatile organic compounds per volume as specified in PART 2 - PRODUCTS.
- C. Standard Cement Grout: ANSI A118.6.
- D. Water-Cleanable Epoxy Grout: ANSI A118.3, with a VOC content of 65 g/L or less when calculated according to 40 CFR 59 (EPA Method 24).
 1. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 60 and 100 degrees C (140 and 212 degrees F), respectively, and certified by manufacturer for intended use.

2.7 PATCHING AND LEVELING COMPOUND

- A. Portland cement base, polymer-modified, self-leveling compound, manufactured specifically for resurfacing and leveling concrete floors. Products containing gypsum are not acceptable.
- B. Provide a patching and leveling compound with the following minimum physical properties:
 1. Compressive strength - 25 MPa (3500 psig) per ASTM C109/C109M.

- 2. Flexural strength - 7 MPa (1000 psig) per ASTM C348 (28 day value).
- 3. Tensile strength – 4.1 MPa (600 psi) per ANSI 118.7.
- 4. Density – 1.9.
- C. Capable of being applied in layers up to 38 mm (1-1/2 inches) thick without fillers and up to 101 mm (4 inches) thick with fillers, being brought to a feather edge, and being troweled to a smooth finish.
- D. Primers, fillers, and reinforcement as required by manufacturer for application and substrate condition.
- E. Ready for use in 48 hours after application.

2.9 WATER

- A. Clean, potable and free from salts and other injurious elements to mortar and grout materials.

2.10 CLEANING COMPOUNDS

- A. Specifically designed for cleaning masonry and concrete and which will not prevent bond of subsequent tile setting materials including patching and leveling compounds and elastomeric waterproofing membrane and coat.
- B. Materials containing acid or caustic Material are not acceptable.

2.11 FLOOR MORTAR BED REINFORCING

- A. ASTM A1064/A1064M welded wire fabric without backing, MW3 x MW3 (2 x 2-W0.5 x W0.5).

PART 3 - EXECUTION

3.1 ENVIRONMENTAL REQUIREMENTS

- A. Maintain ambient temperature of work areas at not less than 16 degrees C (60 degrees F), without interruption, for not less than 24 hours before installation and not less than three (3) days after installation.
- B. Maintain higher temperatures for a longer period of time where required by manufacturer's recommendation and ANSI Specifications for installation.
- C. Do not install tile when the temperature is above 38 degrees C (100 degrees F).

- D. Do not install materials when the temperature of the substrate is below 16 degrees C (60 degrees F).
- E. Do not allow temperature to fall below 10 degrees C (50 degrees F) after third day of completion of tile work.

3.2 ALLOWABLE TOLERANCE

- A. Variation in plane of sub-floor, including concrete fills leveling compounds and mortar beds:
 - 1. Not more than 6 mm in 3048 mm (1/4 inch in 10 feet) from required elevation where portland cement mortar setting bed is used.
 - 2. Not more than 3 mm in 3048 mm (1/8 inch in 10 feet) where dry-set portland cement, and latex-portland cement mortar setting beds and chemical-resistant bond coats are used.
- B. Variation in Plane of Wall Surfaces:
 - 1. Not more than 6 mm in 2438 mm (1/4 inch in 8 feet) from required plane where portland cement mortar setting bed is used.
 - 2. Not more than 3 mm in 2438 mm (1/8 inch in 8 feet) where dry-set or latex-portland cement mortar or organic adhesive setting materials is used.

3.3 SURFACE PREPARATION

- A. Cleaning New Concrete or Masonry:
 - 1. Chip out loose material, clean off all oil, grease dirt, adhesives, curing compounds, and other deterrents to bonding by mechanical method, or by using products specifically designed for cleaning concrete and masonry.
 - 2. Use self-contained power blast cleaning systems to remove curing compounds and steel trowel finish from concrete slabs where ceramic tile will be installed directly on concrete surface with thin-set materials.
 - 3. Steam cleaning or the use of acids and solvents for cleaning will not be permitted.
- B. Patching and Leveling:
 - 1. Mix and apply patching and leveling compound in accordance with manufacturer's instructions.

2. Fill holes and cracks and align concrete floors that are out of required plane with patching and leveling compound.
 - a. Thickness of compound as required to bring finish tile system to elevation shown on construction documents.
 - b. Float finish
 - c. At substrate expansion, isolation, and other moving joints, allow joint of same width to continue through underlayment.
 3. Apply patching and leveling compound to concrete and masonry wall surfaces that are out of required plane.
 4. Apply leveling coats of material compatible with wall surface and tile setting material to wall surfaces, other than concrete and masonry that are out of required plane.
- C. Mortar Bed for Slopes to Drains:
1. Slope compound to drain where drains are shown on construction documents.
 2. Install mortar bed in depressed slab sloped to drains not less than 3.2 mm in 305 mm (1/8 inch per foot).
 3. Allow not less than 50 mm (2 inch) depression at edge of depressed slab.
 4. Screed for slope to drain and float finish.
 5. Cure mortar bed for not less than seven (7) days. Do not use curing compounds or coatings.
 6. Perform flood test to verify mortar bed slopes to drain before installing tile.

Contracting Officer Representative (COR) to be present during flood test.
- D. Additional preparation of concrete floors for tile set with epoxy, or furan-resin is to be in accordance with the manufacturer's printed instructions.
- F. Walls:
1. Apply patching and leveling compound to concrete and masonry surfaces that are out of required plane.

2. Apply leveling coats of material compatible with wall surface and tile setting material to wall surfaces, other than concrete and masonry that are out of required plane.
3. Apply metal lath to framing in accordance with ANSI A108.1:
 - a. Use fasteners specified in paragraph "Fasteners." Use washers when lath opening is larger than screw head.
 - b. Apply scratch and leveling coats to metal lath in accordance with ANSI A108.1C.
 - c. Total thickness of scratch and leveling coats:
 - 1) Apply 9 mm to 16 mm (3/8 inch to 5/8 inch) thick over solid backing.
 - 2) 16 mm to 19 mm (5/8 to 3/4 inch) thick on metal lath over studs.
 - 3) Where wainscots are required to finish flush with wall surface above, adjust thickness required for flush finish.
 - d. Apply scratch and leveling coats more than 19 mm (3/4 inch) thick in two (2) coats.

3.4 CEMENTITIOUS BACKER UNITS

- A. Remove polyethylene wrapping from cementitious backer units and separate to allow for air circulation. Allow moisture content of backer units to dry down to a maximum of 35 percent before applying joint treatment and tile.
- B. Install in accordance with ANSI A118.9 except as specified otherwise.
- C. Install units horizontally or vertically to minimize joints with end joints over framing members. Units with rounded edges; face rounded edge away from studs to form a "V" joint for joint treatment.
- D. Secure cementitious backer units to each framing member with screws spaced not more than 203 mm (8 inches) on center and not closer than 13 mm (1/2 inch) from the edge of the backer unit or as recommended by backer unit manufacturer. Install screws so that the screw heads are flush with the surface of the backer unit.
- E. Where backer unit joins shower pans or waterproofing, lap backer unit over turned up waterproof system. Install fasteners only through top one-inch of turned up waterproof systems.

- F. Do not install joint treatment for seven (7) days after installation of cementitious backer unit.
- G. Joint Treatment:
 - 1. Fill horizontal and vertical joints and corners with latex-portland cement mortar. Apply fiberglass tape over joints and corners and embed with same mortar.
 - 2. Leave 6 mm (1/4 inch) space for sealant at lips of tubs, sinks, or other plumbing receptors.

3.5 CERAMIC TILE – GENERAL

- A. Comply with ANSI A108/A118/A136 series of tile installation standards applicable to methods of installation and TCNA Installation Guidelines.
- B. Installing Mortar Beds for Floors:
 - 1. Install mortar bed in a manner that does not damage cleavage or waterproof membrane; 32 mm (1-1/2 inch) minimum thickness.
 - 2. Install floor mortar bed reinforcing centered in mortar fill.
 - 3. Screed finish to level plane or slope to drains shown on construction documents, float finish.
 - 4. For thin set systems cure mortar bed not less than seven (7) days. Do not use curing compounds or coatings.
 - 5. For tile set with portland cement paste over plastic mortar bed coordinate to set tile before mortar bed sets.
- C. Setting Beds or Bond Coats:
 - 1. Where recessed or depressed floor slabs are filled with portland cement mortar bed, set ceramic mosaic floor tile in either portland cement paste over plastic mortar bed or latex-portland cement mortar over cured mortar bed except as specified otherwise, ANSI A108-1C, TCNA System F121-14 or F111-14.
 - 2. Set wall tile installed over concrete or masonry in dry-set portland cement mortar, or latex-portland cement mortar, ANSI 108.1B and TCNA System W211-14, W221-14 or W222-14.

3. Set wall tile installed over concrete backer board in latex-portland cement mortar, ANSI A108.1B.
 4. Set wall tile installed over portland cement mortar bed on metal lath base in portland cement paste over plastic mortar bed, or dry-set portland cement mortar or latex-portland cement mortar over a cured mortar bed, ANSI A108.1C, TCNA System W231-14, W241-14.
 5. Set trim shapes in same material specified for setting adjoining tile.
- D. Workmanship:
1. Lay out tile work so that no tile less than one-half full size is used. Make all cuts on the outer edge of the field.
 2. Set tile firmly in place with finish surfaces in true planes. Align tile flush with adjacent tile unless shown otherwise on construction documents.
 3. Form intersections and returns accurately.
 4. Cut and drill tile neatly without marring surface.
 5. Cut edges of tile abutting penetrations, finish, or built-in items:
 - a. Fit tile closely around electrical outlets, piping, fixtures and fittings, so that plates, escutcheons, collars and flanges will overlap cut edge of tile.
 - b. Seal tile joints water tight as specified in Section 07 92 00, JOINT SEALANTS, around electrical outlets, piping fixtures and fittings before cover plates and escutcheons are set in place.
 6. Completed work is to be free from hollow sounding areas and loose, cracked or defective tile.
 7. Remove and reset tiles that are out of plane or misaligned.
 8. Floors:
 - a. Extend floor tile beneath casework and equipment, except those units mounted in wall recesses.
 - b. Align finish surface of new tile work flush with other and existing adjoining floor finish where indicated in construction documents.
 - c. In areas where floor drains occur, slope tile to drains.

- d. Push and vibrate tiles over 203 mm (8 inches) square to achieve full support of bond coat.
- 9. Walls:
 - a. Cover walls and partitions, including pilasters, furred areas, and freestanding columns from floor to ceiling, or from floor to nominal wainscot heights as indicated in construction documents with tile.
 - b. Finish reveals of openings with tile, except where other finish materials are indicated in construction documents.
 - c. Finish wall surfaces behind and at sides of casework and equipment, except those units mounted in wall recesses, with same tile as scheduled for room proper.
- 10. Joints:
 - a. Keep all joints in line, straight, level, perpendicular and of even width unless shown otherwise on construction documents.
 - b. Make joints maximum 3 mm (1/8 inch) wide for glazed wall tile and mosaic tile work.
 - c. Make joints in paver tile, porcelain type; maximum 3 mm (1/8 inch) wide.
- 11. Back Buttering: For installations indicated below, obtain 100 percent mortar coverage by complying with applicable special requirements for back buttering of tile in referenced ANSI A108/A118/A136 series of tile installation standards:
 - a. Tile wall installations in wet areas, including showers, tub enclosures, laundries and swimming pools.
 - b. Tile installed with chemical-resistant mortars and grouts.
 - c. Tile wall installations composed of tiles 203 by 203 mm (8 by 8 inches) or larger.
 - d. Exterior tile wall installations.

3.6 PORCELAIN TILE INSTALLED WITH LATEX PORTLAND CEMENT BONDING MORTAR

- A. Due to the denseness of porcelain tile use latex portland cement bonding mortar that meets the requirements of ANSI A108.01. Mix bonding mortars in accordance with

manufacturer's instructions. Provide liquid ratios and comply with dwell times during the placement of bonding mortar and tile.

3.7 THIN SET CERAMIC AND PORCELAIN TILE INSTALLED WITH DRY-SET PORTLAND CEMENT AND LATEX-PORTLAND CEMENT MORTAR

- A. Installation of Tile: ANSI A108.1B, except as specified otherwise.
- B. Slope tile work to drains at not less than 3 mm in 305 mm (1/8 inch per foot).

3.8 THIN SET CERAMIC AND PORCELAIN TILE INSTALLED WITH CHEMICAL-RESISTANT BOND COAT

- A. Epoxy Resin Type: Install tile in accordance with Installation of Tile with Epoxy Mortar; ANSI A108.6.

3.9 GROUTING

- A. Grout Type and Location:
 - 1. Grout for glazed wall and base tile, paver tile and unglazed mosaic tile portland cement grout, latex-portland cement grout, dry-set grout, or commercial portland cement grout.
- B. Workmanship:
 - 1. Install and cure grout in accordance with the applicable standard.
 - 2. Sand Portland Cement Grout: ANSI A108.10.
 - 3. Standard Cement Grout: ANSI A118.6.
 - 4. High Performance Grout: ANSI A118.7.
 - 5. Epoxy Grout: ANSI A108.6.
 - 6. Water-Cleanable Epoxy Grout: ANSI A118.3.

3.10 MOVEMENT JOINTS

- A. Prepare tile expansion, isolation, construction and contraction joints for installation of sealant. Refer to Section 07 92 00, JOINT SEALANTS.
- B. TCNA details EJ 171-14.
- C. At expansion joints, rake out joint full depth of tile and setting bed and mortar bed. Do not cut waterproof or isolation membrane.
- D. Rake out grout at joints between tile, service sink, at toe of base, and where indicated in construction documents not less than 6 mm (1/4 inch) deep.

3.11 CLEANING

- A. Thoroughly sponge and wash tile. Polish glazed surfaces with clean dry cloths.
- B. Methods and materials used are not permitted to damage or impair appearance of tile surfaces.
- C. The use of acid or acid cleaners on glazed tile surfaces is prohibited.
- D. Clean tile grouted with epoxy, furan and commercial portland cement grout and tile set in elastomeric bond coat as recommended by the manufacturer of the grout and bond coat.

3.12 PROTECTION

- A. Keep traffic off tile floor, until grout and setting material is fully set and cured.
- B. Where traffic occurs over tile floor is unavoidable, cover tile floor with not less than 9 mm (3/8 inch) thick plywood, wood particle board, or hardboard securely taped in place. Do not remove protective cover until time for final inspection. Clean tile of any tape, adhesive and stains.

3.15 TESTING FINISH FLOOR

- A. Test floors in accordance with ASTM C627 to show compliance with codes 1 through 10.

--- E N D ---

SECTION 09 51 00
ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Acoustical units.
 - 2. Metal ceiling suspension system for acoustical ceilings.
 - 3. Adhesive application.
 - 4. Acoustical Ceiling Canopy

1.2 RELATED REQUIREMENTS

- A. Adhesive VOC Limits: Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.
- B. Color, pattern, and location of each type of acoustical unit: Section 09 06 00, SCHEDULE FOR FINISHES.
- C. Ceiling Suspension System: Section 09 22 16, NON-STRUCTURAL METAL FRAMING.

1.3 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. ASTM International (ASTM):
 - 1. A641/A641M-09a(2014) - Zinc-coated (Galvanized) Carbon Steel Wire.
 - 2. A653/A653M-15e1 - Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-coated (Galvannealed) by the Hot-Dip Process.
 - 3. C423-09a - Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
 - 4. C634-13 - Terminology Relating to Environmental Acoustics.
 - 5. C635/C635M-13a - Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
 - 6. C636/C636M-13 - Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
 - 7. D1779-98(2011) - Adhesive for Acoustical Materials.

8. E84-15b - Surface Burning Characteristics of Building Materials.
 9. E119-16 - Fire Tests of Building Construction and Materials.
 10. E413-16 - Classification for Rating Sound Insulation.
 11. E580/E580M-14 - Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions.
 12. E1264-14 - Classification for Acoustical Ceiling Products.
- C. International Organization for Standardization (ISO):
1. ISO 14644-1 - Classification of Air Cleanliness.

1.4 PREINSTALLATION MEETINGS

- A. Conduct preinstallation meeting at project site minimum 30 days before beginning Work of this section.
1. Required Participants:
 - a. Contracting Officer's Representative.
 - b. Architect/Engineer and Interior Designer.
 - c. Contractor.
 - d. Installer.
 2. Meeting Agenda: Distribute agenda to participants minimum 3 days before meeting.
 - a. Installation schedule.
 - b. Installation sequence.
 - c. Preparatory work.
 - d. Protection before, during, and after installation.
 - e. Installation.
 - f. Terminations.
 - g. Transitions and connections to other work.
 - h. Inspecting and testing.
 - i. Other items affecting successful completion.
 3. Document and distribute meeting minutes to participants to record decisions affecting installation.

1.5 SUBMITTALS

- A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Submittal Drawings:
 - 1. Show size, configuration, and fabrication and installation details.
- C. Manufacturer's Literature and Data:
 - 1. Description of each product.
 - 2. Ceiling suspension system indicating manufacturer recommendation for each application.
 - 3. Installation instructions.
 - 4. Warranty.
- D. Samples:
 - 1. Acoustical units, 150 mm (6 inches) in size, each type.
 - a. Submit quantity required to show full color and texture range.
 - 2. Suspension system, trim and molding, 300 mm (12 inches) long.
 - 3. Colored markers for access service.
 - 4. Approved samples may be incorporated into work.
- E. Sustainable Construction Submittals:
 - 1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.
 - 2. Biobased Content:
 - a. Show type and quantity for each product.
 - b. Show volatile organic compound types and quantities.
- F. Certificates: Certify each product complies with specifications.
 - 1. Acoustical units, each type.
- G. Qualifications: Substantiate qualifications comply with specifications.
 - 1. Manufacturer with project experience list.
- H. Operation and Maintenance Data:
 - 1. Care instructions for each exposed finish product.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 - 1. Regularly manufactures specified products.
 - 2. Manufactured specified products with satisfactory service on five similar installations for minimum five years.

1.7 DELIVERY

- A. Deliver products in manufacturer's original sealed packaging.
- B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, color, production run number, and manufacture date.
- C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.8 STORAGE AND HANDLING

- A. Store products indoors in dry, weathertight conditioned facility.
- B. Protect products from damage during handling and construction operations.

1.9 FIELD CONDITIONS

- A. Environment:
 - 1. Product Temperature: Minimum 21 degrees C (70 degrees F) for minimum 48 hours before installation.
 - 2. Work Area Ambient Conditions: HVAC systems are complete, operational, and maintaining facility design operating conditions continuously, beginning 48 hours before installation until Government occupancy.
 - 3. Install products when building is permanently enclosed and when wet construction is completed, dried, and cured.

1.10 WARRANTY

- A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Ceiling System: Acoustical ceilings units on exposed grid suspension systems.
- B. Acoustical Canopies / Architectural Elements

2.2 SYSTEM PERFORMANCE

- A. Design product complying with specified performance:
 - 1. Maximum Deflection: 1/360 of span, maximum.
- B. Fire Resistance: ASTM E119; as component of roof-ceiling assembly.
- C. Surface Burning Characteristics: When tested according to ASTM E84.
 - 1. Flame Spread Rating: 25 maximum.
 - 2. Smoke Developed Rating: 450 maximum.

2.3 PRODUCTS - GENERAL

- A. Provide manufacturer's standard panels of configuration indicated that comply with ASTM E1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances unless otherwise indicated.
- B. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.
- C. Provide acoustical units from one manufacturer.
 - 1. Provide each product exposed to view from one production run.
- D. Provide suspension system from same manufacturer.
- E. Sustainable Construction Requirements:
 - 1. Mineral Base Recycled Content: 41 percent, recycled content, minimum. Select products with recycled content to achieve overall Project recycled content requirement.
 - 2. Steel Recycled Content: 30 percent total recycled content, minimum.
 - 3. Biobased Content: 37 percent by weight biobased material, minimum.
 - 4. Low Pollutant-Emitting Materials: Comply with VOC limits specified in Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS for the following products:

- a. Non-flooring adhesives and sealants.

2.4 ACOUSTICAL UNITS

- A. Provide the following lay in panel(s): USG Radar #2310 (AT1)
 - 1. Classification: Provide fire-resistance-rated panels complying with ASTM E 1264 for type, form, and pattern as follows:
 - a. Type and Form: Type IV; Form 2, Fire Class A
 - b. Pattern: G H
 - 2. Color: White
 - 3. LR: Minimum 0.75
 - 4. NRC: minimum 0.55 (ASTM C423)
 - 5. CAC: 30 minimum (ASTM E413)
 - 6. Edge/Joint Detail: Square
 - 7. Thickness: 5/8"
 - 8. Size: 24" X 48"
- B. Provide the following lay in panel(s): Armstrong Clean Room Mylar RH90 #1716 (AT2)
 - 1. Classification: Provide fire-resistance-rated panels complying with ASTM E 1264 for type, form, and pattern as follows:
 - a. Type and Form: Type IV; Form 2, Fire Class A
 - b. Pattern: G H
 - 2. Color: White
 - 3. LR: Minimum 0.86
 - 4. NRC: minimum 0.70 (ASTM C423)
 - 5. CAC: 35 minimum (ASTM E413)
 - 6. Edge/Joint Detail: Square
 - 7. Thickness: 3/4"
 - 8. Size: 24" X 48"
- C. Provide the following lay in panel(s): Armstrong Clean Room Mylar RH90 #1721 (AT3)
 - 1. Classification: Provide fire-resistance-rated panels complying with ASTM E 1264 for type, form, and pattern as follows:

- a. Type and Form: Type IV; Form 2, Fire Class A
 - b. Pattern: E
2. Color: White
3. LR: Minimum 0.86
4. NRC: minimum 0.70 (ASTM C423)
5. CAC: 35 minimum (ASTM E413)
6. Edge/Joint Detail: Square
7. Thickness: 5/8"
8. Size: 24" X 48"
- D. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical panels treated with manufacturer's standard anti-microbial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.
- E. Acoustical Ceiling Canopy (ACC1)
 1. Basis of Design: Subject to compliance with specified requirements provide the following:
 - a. Armstrong Industries; Armstrong SOUNDSCAPES Acoustical Canopies; Item No. 6258.
 2. Acoustical Canopy Standard: Provide manufacturer's standard panels according to ASTM E 1264 and designated by type, form, pattern, acoustical rating, and light reflectance unless otherwise indicated.
 3. Shape: Hill Canopy
 4. Color: Sky (SK)
 5. Size: 46-1/2" x 75" x 1-1/4"
 6. Edge Profile: Square
 7. Composition: Mineral Fiber
 8. Flame Spread: ASTM E84; Class A (IBC)
 9. Light Reflectance (LR) White Panel: ASTM E 1477; 0.86

10. Acoustical Performance: 30 Sabin per panel; ASTM C423
11. Dimensional Stability: Standard
12. Recycle Content: Post-Consumer - 0% Pre-Consumer - 47%

2.5 METAL SUSPENSION SYSTEM

- A. General: ASTM C635, heavy-duty system, except as otherwise specified.
 1. Suspension System: Provide the following:
 - a. Galvanized cold-rolled steel, bonderized.
 2. Main and Cross Runner: Use same construction; do not use lighter-duty sections for cross runners.
- B. Exposed Grid Suspension System: Support of lay-in panels.
 1. Grid Width: 22 mm (7/8 inch) minimum with 8 mm (5/16 inch) minimum panel bearing surface.
 2. Molding: Fabricate from the same material with same exposed width and finish.
 3. Finish: Baked-on enamel flat texture finish.
 - a. Color: To match adjacent acoustical units unless specified otherwise in Section 09 06 00, SCHEDULE FOR FINISHES.
- C. Suspension System Support of Metal Type V, VI, and VII Tiles: Concealed grid type with runners for snap-in attachment of metal tile (pans).
- D. Carrying Channels Secondary Framing: Cold-rolled or hot-rolled steel, black asphaltic paint finish, rust free.
 1. Weight per 300 m (per thousand linear feet), minimum:

Size		Cold-rolled		Hot-rolled	
mm	inches	kg	pound	kg	pound
38	1-1/2	215.4	475	508	1120
50	2	267.6	590	571.5	1260

- E. Anchors and Inserts: Provide anchors or inserts to support twice the loads imposed by hangers.
 1. Hanger Inserts: Steel, zinc-coated (galvanized after fabrication).

- a. Nailing type option for wood forms:
 - 1) Upper portion designed for anchorage in concrete and positioning lower portion below surface of concrete approximately 25 mm (one inch).
 - 2) Lower portion provided with minimum 8 mm (5/16 inch) hole to permit attachment of hangers.
- b. Flush ceiling insert type:
 - 1) Designed to provide a shell covered opening over a wire loop to permit attachment of hangers and keep concrete out of insert recess.
 - 2) Insert opening inside shell approximately 16 mm (5/8 inch) wide by 9 mm (3/8 inch) high over top of wire.
 - 3) Wire 5 mm (3/16 inch) diameter with length to provide positive hooked anchorage in concrete.
- F. Clips: Galvanized steel, designed to secure framing member in place.
- G. Tile Splines: ASTM C635.
- H. Wire: ASTM A641.
 - 1. Size:
 - a. Wire Hangers: Minimum diameter 2.68 mm (0.1055 inch).
 - b. Bracing Wires: Minimum diameter 3.43 mm (0.1350 inch).
- I. Clean-Room Gasket System: Where indicated, provide manufacturer's standard system, including manufacturer's standard gasket and related adhesives, tapes, seals, and retention clips, designed to seal out foreign material.

2.6 ACCESSORIES

- A. Adhesives: Low pollutant-emitting, water based type recommended by adhered product manufacturer for each application.
- B. Perimeter Seal: Vinyl, polyethylene or polyurethane open cell sponge material, density of 1.3 plus or minus 10 percent, compression set less than 10 percent with pressure sensitive adhesive coating on one side.
 - 1. Thickness: As required to fill voids between back of wall molding and finish wall.
 - 2. Size: Minimum 9 mm (3/8 inch) wide strip.

- C. Access Identification Markers: Colored markers with pressure sensitive adhesive on one side, paper or plastic, 6 to 9 mm (1/4 to 3/8 inch) diameter.

1. Color Code: Provide the following color markers for service identification:

Color	Service
Red	Sprinkler System: Valves and Controls
Green	Domestic Water: Valves and Controls
Yellow	Chilled Water and Heating Water
Orange	Ductwork: Fire Dampers
Blue	Ductwork: Dampers and Controls
Black	Gas: Laboratory, Medical, Air and Vacuum

2. The contractor installing the above listed service(s) shall be responsible for installing required colored markers for their own work. Contractor removing existing suspended ceilings shall be responsible for installing new color-coded markers in locations that had markers.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine and verify substrate suitability for product installation.
- B. Protect existing construction and completed work from damage.

3.2 INSTALLATION - GENERAL

- A. Install products according to manufacturer's instructions and approved submittal drawings.
1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.

3.3 ACOUSTICAL UNIT INSTALLATION

- A. Applications:

1. Cut acoustic units for perimeter borders and penetrations to fit tight against penetration for joint not concealed by molding.
- B. Layout acoustical unit symmetrically, with minimum number of joints.
- C. Installation:
 1. Install acoustic tiles after wet finishes have been installed and solvents have cured.
 2. Install lay-in acoustic panels in exposed grid with minimum 6 mm (1/4 inch) bearing at edges on supports.
 - a. Install tile to lay level and in full contact with exposed grid.
 - b. Replace cracked, broken, stained, dirty, or tile.
 3. Tile in concealed grid upward access suspension system:
 - a. Install acoustical tile with joints close, straight and true to line, and with exposed surfaces level and flush at joints.
 - b. Make corners and arises full, and without worn or broken places.
 - c. Locate acoustical units providing access to service systems.
 4. Markers:
 - a. Install color coded markers to identify the various concealed piping, mechanical, and plumbing systems.
 - b. Attach colored markers to exposed grid on opposite sides of the units providing access.
 - c. Attach marker on exposed ceiling surface of upward access acoustical unit.
- D. Touch up damaged factory finishes.
 1. Repair painted surfaces with touch up primer.
- E. Install acoustical panels in coordination with suspended system, with edges resting on flanges of main runner and cross tees. Cut and fit panels neatly against abutting surfaces. Support edges by wall moldings.

3.4 CEILING SUSPENSION SYSTEM INSTALLATION

- A. General: Install according to ASTM C636.
 1. Use direct or indirect hung suspension system or combination of both.
 2. Support a maximum area of 1.48 sq. m (16 sq. ft.) of ceiling per hanger.

3. Prevent deflection in excess of $1/360$ of span of cross runner and main runner.
 4. Provide additional hangers located at each corner of support components.
 5. Provide minimum 100 mm (4 inch) clearance from the exposed face of the acoustical units to the underside of ducts, pipe, conduit, secondary suspension channels, concrete beams or joists; and steel beam or bar joist unless furred system is shown.
 6. Provide main runners minimum 1200 mm (48 inches) in length.
 7. Install hanger wires vertically. Angled wires are not acceptable except for seismic restraint bracing wires.
 8. Install end hangers 200 mm (8 inches) maximum from wall, for main and cross runners.
 9. Attach hangers to main and cross runners to allow easy removal of acoustical tile and lay-in panels. All hangers shall be taut with 3 complete turns around self.
- B. Direct Hung Suspension System: ASTM C635.
1. Support main runners by hanger wires attached directly to the structure overhead.
 2. Maximum spacing of hangers, 1200 mm (4 feet) on centers unless interference occurs by mechanical systems. Use indirect hung suspension system where not possible to maintain hanger spacing.
- C. Anchorage to Structure:
1. Concrete:
 - a. Install hanger inserts and wire loops required for support of hanger and bracing wire. Install hanger wires with looped ends through steel deck when steel deck does not have attachment device.
 - b. Use eye pins or threaded studs with screw-on eyes in existing or already placed concrete structures to support hanger and bracing wire. Install in sides of concrete beams or joists at mid height.
 2. Steel:
 - a. Install carrying channels for attachment of hanger wires.
 - 1) Size and space carrying channels to support load within performance limit.

- 2) Attach hangers to steel carrying channels, spaced four feet on center, unless area supported or deflection exceeds the amount specified.
 - b. Attach carrying channels to the bottom flange of steel beams spaced not 1200 mm (4 feet) on center before fireproofing is installed. Weld or use steel clips for beam attachment.
 - c. Attach hangers to bottom chord of bar joists or to carrying channels installed between the bar joists when hanger spacing prevents anchorage to joist. Rest carrying channels on top of the bottom chord of the bar joists, and securely wire tie or clip to joist.
- D. Indirect Hung Suspension System: ASTM C635.
- 1. Space carrying channels for indirect hung suspension system maximum 1200 mm (4 feet) on center. Space hangers for carrying channels maximum 2400 mm (8 feet) on center or for carrying channels less than 1200 mm (4 feet) or center so as to insure that specified requirements are not exceeded.
 - 2. Support main runners by specially designed clips attached to carrying channels.
- E. Seismic Ceiling Bracing System:
- 1. Install according to ASTM E580.
 - 2. Connect bracing wires to structure above as specified for anchorage to structure and to main runner or carrying channels of suspended ceiling at bottom.

3.5 CEILING TREATMENT

- A. Moldings:
- 1. Install metal wall molding at perimeter of room, column, or edge at vertical surfaces.
 - 2. Install special shaped molding at changes in ceiling heights and at other breaks in ceiling construction to support acoustical units and to conceal their edges.
- B. Perimeter Seal:
- 1. Install perimeter seal between vertical leg of wall molding and finish wall, partition, and other vertical surfaces.

2. Install perimeter seal to finish flush with exposed faces of horizontal legs of wall molding.

3.6 CLEANING

- A. Remove excess adhesive before adhesive sets.
- B. Clean exposed surfaces. Remove contaminants and stains.

--- E N D ---

SECTION 09 54 26
SUSPENDED WOOD CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The Suspended Wood Ceiling systems covered by this specification shall be the products of the Rulon International, World Commerce Center, 2000 Ring Way Road, St. Augustine, FL 32092. Phone: 800-227-8566, Fax: 904-584-1499. Local Contact: Douglas Wright- Regional Sales Representative, Phone: 314-580-5391, Fax: 314-667-3503.
- B. The General Conditions and the requirements of Division 1 of the Specifications shall apply to all work hereunder.
- C. All work shall be performed in accordance with the manufacturer's instructions, and in a manner satisfactory to the owner's representative.

1.2 SUMMARY

- A. Section Includes:
 - 1. Linear Ceiling Panels
 - 2. Panel Grille Ceiling Panel
 - 3. Suspension Systems

1.3 SCOPE

- A. Rulon International shall furnish all Suspended Wood Ceiling systems and specified matching trims.

1.4 REFERENCES

- A. ASTM E 84 – Title; 2001.
- B. FSC STD-01-001 – FSC Principles and Criteria for Forest Stewardship
- C. FSC STD-40-004 – FSC Standard for Chain of Custody Certification
- D. U.S. Green Building Council, LEED Building Design and Construction (BD+C)Version 4.0 Rating System. (LEED v4.0).

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Installer shall be a firm with not less than two (2) years of successful experience in installation of suspended wood ceilings of similar requirements to this project. The installer shall be acceptable to the architect, manufacturer, and owner's representative.
- B. Fire Performance Characteristics: Rulon Suspended Wood Ceilings shall conform to Class 1, or A flame spread rating, when tested according to ASTM E-84.

1.6 PROJECT CONDITIONS

- A. Installation shall be done only when the temperature and humidity closely approximate the interior conditions that will exist when the building is occupied. The heating and cooling systems shall be operating before, during, and after installation, with the humidity of the interior spaces maintained between 25% and 55%.
- B. It is important that plenums have proper ventilation, especially in high moisture areas. There shall be no excessive buildup of heat in the ceiling areas.
- C. Prior to the start of installation, all exterior windows and doors are to be in place, glazed, and weather-stripped. The roof is to be watertight, and all wet trades' work is to be completed, and thoroughly dry.
- D. Mechanical, electrical, and other utility service installations above the ceiling plane shall have been completed. No materials should rest against, or wrap around, the ceiling suspension components or connecting hangers.

1.7 SUBMITTALS

- A. Product Data: Rulon International shall provide product specifications for all ceiling materials supplied.
- B. Shop Drawings: Rulon International shall supply shop drawings showing Suspended Wood Ceiling System locations, and placement of hangers, carriers, and other details deemed pertinent to proper installation.
- C. Samples: A physical wood sample with designated finishes shall be submitted for approval.
- D. Closeout Submittals: Provide manufacturer's maintenance instructions for product(s)/finishes specified.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. The Suspended Wood Ceiling Systems shall be delivered to the project site in original, unopened packages.
- B. The Suspended Wood Ceiling Systems shall be stored flat and level in a fully enclosed space. For a minimum of seventy-two (72) hours immediately prior to ceiling installation, the Suspended Wood Ceiling Systems shall be stored in the room in which they will be installed. The temperature and humidity of the room shall closely approximate those conditions that will exist when the building is occupied. The Suspended Wood Ceiling Systems shall be stored off the floor.
- C. Care in handling must be exercised to avoid damage.

1.9 COORDINATION

- A. Layout and installation of the wood slats ceiling system shall be coordinated with other work penetrating the ceiling including light fixtures, HVAC, and fire suppression system components.

1.10 WARRANTIES

- A. Manufacturer: All materials supplied by the ceiling manufacturer shall be guaranteed against manufacturing defects for one (1) year. Because of differing site conditions, wood stains and colorings can vary with age and shall be excluded from this warranty.
- B. Contractor: All work shall be guaranteed for one (1) year from final acceptance of completed work

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design: Subject to compliance with requirements, provide the following products by Rulon International, Inc., or an approved comparable product.

2.2 LINEAR WALL & CEILING PANELS (LWC1)

- A. Style: Linear Panelized. Linear Panelized can be provided in specific lengths up to 10 feet and panel widths as wide as 3 feet.
 - 1. Module is 4-1/2 inch (114 mm) module, having wood strips 3/4 inch (19 mm) thick by 3-3/4 inch (95 mm) wide, and a 3/4 inch (19 mm) reveal.

2. Panels shall be assembled 18 inches wide in 10 foot lengths. Panels shall be fastened together with woodbackers, positioned 5-1/2 inches (140 mm) from the ends and 12 inches (305 mm) on center, with overlapping attachment to the next panel for support of the system. Paint woodbackers black.
3. Panel Size: 18 inches wide x 10 foot length
4. Trim and Border Treatment: Provide end caps or junction trims as indicated.
5. Wood Species: Cherry
6. Finish: To be selected from Manufacturer's full available range.
7. Field cut panels out to match design as indicated on the drawings. Finish exposed edges to match wood species/finish selected.

2.3 LINEAR CEILING PANELS 6" (LWC3)

- A. Style: Linear Panelized. Linear Panelized can be provided in specific lengths up to 10 feet and panel widths as wide as 3 feet.
 1. Module is 6 inch (114 mm) module, having wood strips 3/4 inch (19 mm) thick by 5-1/4 inch (95 mm) wide, and a 3/4 inch (19 mm) reveal.
 2. Panels shall be assembled 24 inches wide in 10 foot lengths. Panels shall be fastened together with woodbackers, positioned 5-1/2 inches (140 mm) from the ends and 12 inches (305 mm) on center, with overlapping attachment to the next panel for support of the system. Paint woodbackers black.
 3. Panel Size: 24 inches wide x 10 foot length
 4. Trim and Border Treatment: Provide end caps or junction trims as indicated.
 5. Wood Species: Cherry
 6. Finish: To be selected from Manufacturer's full available range.
 7. Field cut panels out to match design indicated on drawings. Finish exposed edges to match wood species/finish selected.

2.4 LINEAR WALL GRILLE PANELS (LWC2)

- A. Standard Panel Grilles are 1 foot (305 mm) wide and in nominal lengths of 2 feet (610 mm) to 10 feet (3048 mm) in 1 foot (305 mm) increments. Actual lengths are 1 inch (25 mm) shorter to allow for a reveal between panels. Wood strips are fabricated without fingerjoints, and fastened together with dowels or woodbackers, depending on panel design. Dowels or woodbackers are positioned 5-1/2 inches (140 mm) from the ends and 12 inches (305 mm) on center, with interconnecting male-to-female dowel attachment or with overlapping woodbackers, depending on panel design for support of the system. Paint dowels or woodbackers custom color to match LWC1 wood finish.
 1. Profiles: Panel Size:
 - a. Size: 12 inch wide x 5 feet wide
 - 1) Number of Blades per foot: 6
 - 2) Blade Thickness: 3/4 inch

- 3) Depth of the Blades: 2 inch
2. Panel Design Description:
 - a. Doweled Panel Grilles:
 - 1) Grilles consist of individual wood strips assembled in 12 inch widths in lengths up to 10 feet. Wood strips are drilled 12 inches on center, beginning 5-1/2 inch from each end. Dowels are positioned perpendicular to the wood strips. Panel Grilles are 1 inch under an even foot length. Dowels are generally furnished black to be hidden from view. Dowel clips are used to snap the Panel Grilles into place.
 - b. Blade Design:
 - 1) B Bullnose Blade
 - c. Trim and Border Treatment: Provide end caps or junction trims as indicate on the Drawings in the same species and finish as the Panel Grille.
 - d. Wood Species: Cherry
 - e. Finish: To be selected from Manufacturer's full available range.
 - f. Field cut panels and dowels out to match design indicated on the drawings. Finish exposed edges with manufacturer's recommended finish to match wood species/finish selected.

2.5 ACCESSORIES

- A. C-Hangers: Suspension hangers that are direct-screwed to the panel and hang over the heavy duty grid. Hangers are made of spring-steel with phosphate pre-treatment and corrosion-resistant coating.
- B. Torsion Springs and Saddle Clips: Two parts of a suspension system in which the torsion spring is direct-screwed to the panel and compressed to attach to the saddle clip that is fitted over the heavy duty-grid. Springs and clips are made of spring-steel with phosphate pre-treatment and corrosion-resistant coating.
- C. Dowel Clips: Clips are spring-steel with phosphate pre-treatment and corrosion-resistant coating and are attached by fitting around the dowel and attaching to the grid system.
- D. Woodbacker Clips: Clips are spring-steel with phosphate pre-treatment and corrosion-resistant coating and are attached by fitting around the woodbacker and attaching to the grid system.

2.6 SUSPENSION-SYSTEM HANGERS, BRACES, AND TIES

- A. Main Tees: Standard heavy duty 15/16 inch (24 mm) T-rail specified in Section 09 22 26 – Suspension Systems.

- B. Hangers; shall be suspended ceiling panels from T-rail (supplied by contractor) using torsion springs, C-hangers, or direct screw attachment, as recommended by manufacturer.
 - 1. System for Linear 4.5 inch open, 6 inch open, and 4 inch closed shall consist of Rulon cliprails, installed on #12-gauge wire hangers.
 - 2. Linear wood system cliprail shall use clips factory-attached to the main tees, factory indexed to maintain the specified module.

2.7 EDGES, BORDRES, AND PERIMETER TRIMS

- A. Perimeter trim to be 4 inches in height, trim to be attached directly to structure. Edges, borders, and perimeter trims, shall be designated by specifier in accordance with standard design details available. All wood products specified shall be supplied by the ceiling manufacturer.
- B. Edges, borders, and perimeter trims shall be indicated on the Drawings in accordance with the manufacturer's standard design details. All suspended wood ceiling products specified shall be supplied by the wood slat ceiling manufacturer.

2.8 FINISHES AND COLORS

- A. The Linear Ceiling Panels and Panel Grille Ceiling Panels face and edge surfaces shall be factory finished. Wood is a natural product with variations in grain, texture and color – often ranging from light to dark – there by affecting the surface look. Product finishes shall be stain or sealer coats – spray applied to a smooth sanded surface.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing and substrates to which suspended wood ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage, and with requirements for installation tolerances and other conditions affecting performance of suspended wood ceilings.
- B. Proceed with installation only after unsatisfactory conditions have been corrected. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

- C. Verify the T-rail carriers specification in Section 09 22 26 – Suspension Systems are in place, suspended and leveled in a direction perpendicular to the wood strip direction of the wood panels.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation and prepare surfaces using the manufacturer's recommendations for achieving the best result under project conditions.
- B. Work shall not begin until the space is fully enclosed and glazed all wet work is completed and dried out to the satisfaction manufacturer.
- C. Temperature shall be at least 65 degrees Fahrenheit during installation and thereafter.
- D. Ceiling Layout: The contractor shall measure ceiling areas and establish layout of hangers and T-rails, in accordance with installation instructions.
- E. Coordination: The contractor shall furnish the layout for supports that shall be installed for suspension of ceilings. He shall furnish concrete inserts, steel deck hanger clips, or similar devices for installation, in time to coordinate the work. The contractor shall coordinate with other trades the location of devices which will penetrate the Ceiling Panels or interfere with the installation. Recessed or surface devices located within the ceiling panels are to be located and cut in the field.

3.3 INSTALLATION

- A. The contractor shall install materials in accordance with Rulon International printed instructions and architect's drawings. The installation shall comply with applicable regulations and industry standards.

3.4 ADJUSTMENT, CLEANING, AND REPAIR

- A. The contractor shall make final adjustment to level or contours.
- B. Upon completion of ceiling installation, all Suspended Wood Ceilings shall be cleaned free of dirt, dust, grease, oils, and fingerprints.
- C. All work which cannot be successfully cleaned and repaired shall be removed and replaced.

3.5 INSPECTION

- A. Upon completion of installation, the owner's representative shall inspect all finished surfaces to ensure that work has been performed in a manner satisfactory to the owner. Any deficiencies in the installed Ceiling Panels shall be corrected by the contractor at no additional cost to the owner, or to the manufacturer.

3.6 SUBSTITUTIONS

- A. Equal products may be submitted for approval but no less than (10) days prior to bid. Submittals shall include the name and model number of the proposed product being submitted for approval. The manufacture will also include all information specific to the model necessary to corroborate direct compliance with the quality threshold of the specified material.

--- E N D ---

SECTION 09 65 13
RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Resilient base (RB) adhered to interior walls and partitions.

1.2 RELATED REQUIREMENTS

- A. Sheet Flooring Integral Base: Section 09 65 16, RESILIENT SHEET FLOORING.

1.3 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. ASTM International (ASTM):
 - 1. F1344-15 - Rubber Floor Tile.
 - 2. F1859-14 - Rubber Sheet Floor Covering without Backing.
 - 3. F1860-14 - Rubber Sheet Floor Covering with Backing.
 - 4. F1861-08(2012)e1 - Resilient Wall Base.
 - 5. D4259-88(2012) - Abrading Concrete.
- C. Federal Specifications (Fed. Spec.):
 - 1. RR-T-650E - Treads, Metallic and Non-Metallic, Skid-Resistant.
- D. International Concrete Repair Institute (ICRI):
 - 1. 310.2R-13 - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays.

1.4 SUBMITTALS

- A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data:
 - 1. Description of each product.
 - 2. Adhesives and primers indicating manufacturer's recommendation for each application.

- 3. Installation instructions.
- C. Samples:
 - 1. Resilient Base: 150 mm (6 inches) long, each type and color.
 - 2. Resilient Stair Treads: 150 mm (6 inches) long, each type and color.
 - 3. Sheet Rubber Flooring: 300 mm (12 inches) square, each type and color.
- D. Sustainable Construction Submittals:
 - 1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.
 - 2. Low Pollutant-Emitting Materials:
 - a. Stair Treads and Sheet Rubber Flooring: Submit FloorScore label.
 - b. Show volatile organic compound types and quantities.
- E. Operation and Maintenance Data:
 - 1. Care instructions for each exposed finish product.

1.5 DELIVERY

- A. Deliver products in manufacturer's original sealed packaging.
- B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, color, production run number, and manufacture date.
- C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.6 STORAGE AND HANDLING

- A. Store products indoors in dry, weathertight facility.
- B. Protect products from damage when handling and during construction operations.

1.7 FIELD CONDITIONS

- A. Environment:
 - 1. Product Temperature: Minimum 21 degrees C (70 degrees F) for minimum 48 hours before installation.
 - 2. Work Area Ambient Temperature Range: 21 to 27 degrees C (70 to 80 degrees F) continuously, beginning 48 hours before installation.

3. Install products when building is permanently enclosed and when wet construction is completed, dried, and cured.

1.8 WARRANTY

- A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 PRODUCTS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 1. Tarkett, Johnsonite
- B. Provide each product from one manufacturer and from one production run.
- C. Sustainable Construction Requirements:
 - Meet Section 01 81 13 for overall project recycled content requirements.

2.2 RESILIENT BASE

- A. Product Standard:
 1. Type: Vinyl
 2. ASTM F 1861, Type TV thermoplastic vinyl, Group 2 – layered (solid, homogeneous).
- B. Style and Locations:
 1. Style A - Straight. Provide in areas with carpet.
 2. Style B - Cove. Provide in areas with resilient flooring, where ICB is not specified.
- C. Thickness: 0.125 inch (3.2 mm).
- D. Height: 4 inches (102 mm)
- E. Lengths: Coils in manufacturer's standard length.
- F. Outside Corners: Job formed.
- G. Inside Corners: Job formed.
- H. Colors: As specified in Section 09 06 00, SCHEDULE FOR FINISHES.

2.3 RESILIENT ACCESSORIES

- A. Product Standard:

1. Type: Vinyl
 2. ASTM F 1861, Type TV thermoplastic vinyl, Group 2 – layered (solid, homogeneous).
- B. Style and Locations: As indicated on drawings.
- C. Colors: As specified in Section 09 06 00, SCHEDULE FOR FINISHES.

2.4 PRIMER (FOR CONCRETE FLOORS)

- A. Primer: Type recommended by adhesive manufacturer.

2.5 LEVELING COMPOUND (FOR CONCRETE FLOORS)

- A. Leveling Compound: Provide products mixed with latex or polyvinyl acetate resins.

2.6 ADHESIVES

- A. Adhesives: Low pollutant-emitting, water based type recommended by adhered product manufacturer for each application.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine and verify substrate suitability for product installation.
- B. Protect existing construction and completed work from damage.

3.2 INSTALLATION GENERAL

- A. Install products according to manufacturer's instructions.
1. When instructions deviate from specifications, submit proposed resolution for Contracting Officer consideration.

3.3 RESILIENT BASE INSTALLATION

- A. Applications:
1. Install resilient base in rooms scheduled on Drawings.
 2. Install resilient base on walls, pilasters, casework, and other curb supported fixed equipment.
 3. Extend resilient base into closets, alcoves, and cabinet knee spaces, and around columns within scheduled room.
- B. Lay out resilient base with minimum number of joints.

1. Length: 600 mm (24 inches) minimum, each piece.
 2. Locate joints 150 mm (6 inches) minimum from corners and intersection of adjacent materials.
- C. Installation:
1. Apply adhesive uniformly for full contact between resilient base and substrate.
 2. Set resilient base with hairline butted joints aligned along top edge.
- D. Field form corners and end stops.
1. V-groove back of outside corner.
 2. V-groove face of inside corner and notch cove for miter joint.
- E. Roll resilient base ensuring complete adhesion.

3.4 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strip at edges of floor covering that would otherwise be exposed.

3.5 CLEANING

- A. Remove excess adhesive before adhesive sets.
- B. Clean exposed resilient base. Remove contaminants and stains.
1. Clean with mild detergent. Leave surfaces free of detergent residue.
- C. Polish exposed resilient base to gloss sheen.

3.6 PROTECTION

- A. Protect products from construction traffic and operations.
1. Cover resilient flooring with reinforced kraft paper, and plywood or hardboard.
 2. Maintain protection until directed by Contracting Officer's Representative.
- B. Replace damaged products and re-clean.
1. Damaged Products include cut, gouged, scraped, torn, and unbonded products.

-- E N D --

SECTION 09 65 16
RESILIENT SHEET FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Resilient sheet flooring (RSF) with heat welded seams and integral cove base.

1.2 RELATED REQUIREMENTS

- A. Adhesive VOC Limits: Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.
- B. Color, Pattern and Texture: Section 09 06 00, SCHEDULE FOR FINISHES.
- C. Resilient Base over Base of Lockers, Equipment and Casework: Section 09 65 13, RESILIENT BASE AND ACCESSORIES.
- D. Resilient Base Required Over Metal Base of Casework: Section 12 31 00, MANUFACTURED METAL CASEWORK.

1.3 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. ASTM International (ASTM):
 1. D4259-88(2012) - Abrading Concrete.
 2. E648-15e1 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.
 3. E662-15a - Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials.
 4. F1303-04(2014) - Sheet Vinyl Floor Covering with Backing.
 5. F1860-14 - Rubber Sheet Floor Covering With Backing.
 6. F1913-04(2014) - Vinyl Sheet Floor Covering Without Backing.
- C. International Concrete Repair Institute (ICRI):
 1. 310.2R-13 - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays, and Concrete Repair.
- D. SCS Global Services (SCS):

1. FloorScore.

1.4 SUBMITTALS

- A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
 1. Show size, configuration, and fabrication and installation details.
- B. Manufacturer's Literature and Data:
 1. Description of each product.
 2. Application and Installation instructions.
 3. Warranty.
- C. Samples:
 1. Sheet material, 38 mm by 300 mm (1-1/2 inch by 12 inch), of each color and pattern with welded seam using specified welding rod 300 mm (12 inches) square for each type, pattern and color.
 2. Cap strip and fillet strip, 300 mm (12 inches) for integral base.
 3. Shop Drawings and Certificates: Layout of joints showing patterns where joints are expressed, and type and location of obscure type joints. Indicate orientation of directional patterns.
 4. Certificates: Quality Control Certificate Submittals and lists specified in paragraph, QUALIFICATIONS.
 5. Edge strips: 150 mm (6 inches) long each type.
 6. Primer: Pint container, each type.
- D. Sustainable Construction Submittals:
 1. Low Pollutant-Emitting Materials:
 - a. Sheet Flooring: Submit FloorScore label.
 - b. Identify volatile organic compound types and quantities.
- E. Certificates: Certify each product complies with specifications.
 1. Heat welded seaming is manufacturer's prescribed method of installation.
- F. Qualifications: Substantiate qualifications comply with specifications.
 1. Manufacturer with project experience list.

2. Installer with project experience list.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A company specializing in installation with minimum three (3) years' experience and employs experienced flooring installers who have retained, and currently hold, an INSTALL Certification, or a certification from a comparable certification program.
 1. Installers to be certified by INSTALL or a comparable certification program with the following minimum criteria:
 - a. US Department of Labor approved four (4) year apprenticeship program, 160 hours a year.
 - b. Career long training.
 - c. Manufacturer endorsed training.
 - d. Fundamental journeyman skills certification.
- B. Furnish product type materials from the same production run.

1.6 DELIVERY

- A. Deliver products in manufacturer's original sealed packaging.
- B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, color, production run number, and manufacture date.
- C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.7 STORAGE AND HANDLING

- A. Store products indoors in dry, weathertight conditioned facility.
- B. Protect products from damage during handling and construction operations.

1.8 FIELD CONDITIONS

- A. Environment:
 1. Work Area Ambient Temperature Range: Minimum 18 to 38 degrees C (65 to 100 degrees F) continuously, beginning 48 hours before installation. Maintain room temperature above 18 degrees C (65 degrees F) after installation.

2. Install products when building is permanently enclosed and when wet construction is completed, dried, and cured.

1.9 WARRANTY

- A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."
- B. Manufacturer's Warranty: Warrant resilient sheet flooring against material and manufacturing defects.
 1. Warranty Period: 2 years.

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

- A. Sheet Flooring:
 1. Critical Radiant Flux: ASTM E648; 0.45 watts per sq.cm or more, Class I.
 2. Smoke Density: ASTM E662; less than 450.

2.2 PRODUCTS - GENERAL

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 1. Tarkett, Johnsonite
- B. Provide vinyl sheet color and pattern from one production run.
- C. Sustainable Construction Requirements:
 1. Low Pollutant-Emitting Materials: Comply with VOC limits specified in Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS for the following products:
 - a. Flooring Adhesives and Sealants.
 - b. Vinyl Sheet Flooring.

2.3 RESILIENT SHEET FLOORING

- A. Product Standard:
 1. Type: Vinyl, without backing
 2. ASTM F1913
 3. Thickness: 2.0 mm

4. Wear Surface: Smooth.
5. Sheet Width: As standard with manufacturer.
6. Seamless-Installation Method: Heat welded.
7. Colors and Patterns: As specified in Section 09 06 00, SCHEDULE FOR FINISHES.

2.4 ACCESSORIES

- A. Bonding Chemical: Flooring manufacturer's standard seam bonding chemical.
- B. Welding Rod: Flooring manufacturer's standard, in color matching field color of sheet flooring.
- C. Adhesives: Water resistant type recommended by flooring manufacturer to suit application.
- D. Base Accessories:
 1. Fillet Strip: 19 mm (3/4 inch) radius fillet strip compatible with flooring material.
 2. Cap Strip: J-Shape extruded flanged reducer strip compatible with flooring material approximately 25 mm (1 inch) exposed height with 13 mm (1/2 inch) flange.
- E. Leveling Compound:
 1. Provide cementitious type with latex or polyvinyl acetate resins additive.
- F. Primer:
 1. Type recommended by adhesive or flooring manufacturer.
- G. Sealant:
 1. As specified in Section 07 92 00, JOINT SEALANTS.
 2. Compatible with flooring.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine and verify substrate suitability for product installation.
- B. Protect existing construction and completed work from damage.
- C. Ensure interior finish work such as plastering, drywall finishing, concrete, terrazzo, ceiling work, and painting work is complete and dry before installation.
 1. Complete mechanical, electrical, and other work above ceiling line.

2. Ensure heating, ventilating, and air conditioning systems are installed and operating in order to maintain temperature and humidity requirements.
- D. Correct substrate deficiencies.
 1. Fill cracks, pits, and dents with leveling compound.
 2. Grind, sand, or cut away protrusions. Grind high spots.
 3. Level flooring substrate to 3 mm (1/8 inch) maximum variation.
- E. Clean substrates. Remove contaminants capable of affecting subsequently installed product's performance.
 1. Mechanically clean concrete floor substrate according to ASTM D4259.
 2. Surface Profile: ICRI 310.2R CSP 3 to CSP 4.
- F. Perform flooring manufacturer's recommended bond, substrate moisture content, and pH tests.
- G. Broom or vacuum clean substrates immediately before flooring installation.
- H. Primer: Apply primer according to manufacturer's instructions.

3.2 INSTALLATION - GENERAL

- A. Install products according to manufacturer's instructions.
 1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.

3.3 INSTALLATION OF FLOORING

- A. Flooring Layout:
 1. Arrange pattern in one direction as indicated in drawings with joints pattern matched.
 2. Extend flooring wall-to-wall, under cabinets, casework, laboratory and pharmacy furniture, and other equipment for seamless flooring installation.
 3. Arrange sheets to minimize seams.
 4. Locate seams in inconspicuous and low traffic areas, minimum 150 mm (6 inches) away from parallel joints in flooring substrates.
- B. Match edges of flooring for color shading and pattern at seams.

- C. Install flooring flush with adjacent floor finishes.
- D. Extend flooring into toe spaces, door reveals, closets, and similar openings.
- E. Install flooring fully adhered to substrate.
 - 1. Air pockets or loose edges are not acceptable.
 - 2. Trim sheet materials tight to flooring penetrations; seal joints at pipe with waterproof sealant specified in Section 07 92 00, JOINT SEALANTS.
- F. Butt joints tight, without gaps and bulges.
- G. Installation of Edge Strips:
 - 1. Install edge strips at flooring terminations and transitions to other floor finishes.
 - 2. Locate edge strips under center lines of doors unless otherwise indicated on interior finish plan drawings.
 - 3. Set edge strips in adhesive and mechanically fasten to substrate.

3.4 INTEGRAL COVE BASE INSTALLATION

- A. Set preformed fillet strip at floor intersection with walls and other vertical surfaces.
- B. Extend flooring over fillet strip and 100 mm (4 inches) or 150 mm (6 inches) up wall surface as indicated on drawings.
- C. Form straight or radius internal and external corners to suit Application.
- D. Adhere base to wall surface.
- E. Terminate base exposed top edge with cap strip. Seal cap strip to wall with sealant.
- F. Weld joints as specified for flooring.

3.5 HEAT WELDING

- A. Heat weld joints of flooring and base using coordinating weld rod to match flooring.
- B. Rout joint, insert welding rod into routed space, and fuse flooring and welding rods for seamless, watertight installation.
 - 1. Fuse joints for seamless weld.
- C. Finish joints flush, free from voids, and recessed or raised areas.

3.6 CLEANING

- A. Remove excess adhesive before adhesive sets.

- B. Clean and polish materials.
- C. Vacuum floor thoroughly.
- D. Perform initial maintenance according to flooring manufacturer's instructions.
 - 1. Delay washing flooring until adhesive is fully set and welded joints can contain wash water.

3.7 PROTECTION

- A. Protect flooring from traffic and construction operations.
- B. Keep traffic off sheet flooring for minimum 24 hours after installation.
- C. Cover flooring with reinforced kraft paper, and plywood or hardboard.
- D. Remove protective materials immediately before acceptance.
- E. Repair damage.
- F. Apply polish to vinyl flooring if recommended by resilient sheet flooring manufacturer.
- G. Buff flooring to uniform sheen.

-- E N D --

SECTION 09 65 19
RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies the installation of luxury vinyl tile, and accessories required for a complete installation.

1.2 RELATED WORK

- A. Sustainable Design Requirements: Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.
- B. Resilient Base: Section 09 65 13, RESILIENT BASE AND ACCESSORIES.
- C. Subfloor Testing and Preparation: Section 09 05 16, SUBSURFACE PREPARATION FOR FLOOR FINISHES.
- D. Removal of Existing Construction Containing Asbestos: Section 02 82 13.19, ASBESTOS FLOOR TILE AND MASTIC ABATEMENT.
- E. Color, Pattern and Texture for Resilient Tile Flooring and Accessories: Section 09 06 00, SCHEDULE FOR FINISHES.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Sustainable Design Submittals as described below:
 - 1. Volatile organic compounds per volume as described in PART 2 - PRODUCTS.
- C. Manufacturer's Literature and Data:
 - 1. Description of each product.
 - 2. Resilient material manufacturer's recommendations for adhesives, underlayment, primers, and polish.
 - 3. Application, installation and maintenance instructions.
- D. Samples:
 - 1. Tile: Each type, color, thickness and finish.
 - 2. Edge Strips: Each type, color, thickness and finish.

3. Feature Strips: Each type, color, thickness and finish.

E. Shop Drawings:

1. Layout of patterns as shown on the construction documents.
2. Edge strip locations showing types and detail cross sections.

F. Test Reports:

1. Abrasion resistance: Depth of wear for each tile type and color and volume loss of tile, certified by independent laboratory. Tested per ASTM F510/F510M.
2. Moisture and pH test results as per Section 09 05 16, SUBSURFACE PREPARATION FOR FLOOR FINISHES.

1.4 DELIVERY

- A. Deliver materials to the site in original sealed packages or containers, clearly marked with the manufacturer's name or brand, type and color, production run number and date of manufacture.
- B. Materials from containers which have been distorted, damaged or opened prior to installation are not acceptable.

1.5 STORAGE

- A. Store materials in a clean, dry, enclosed space off the ground, protected from harmful weather conditions and at temperature and humidity conditions recommended by the manufacturer. Protect adhesives from freezing. Store flooring, adhesives, and accessories in the spaces where they will be installed for at least 48 hours before beginning installation.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A company specializing in installation with minimum three (3) years' experience and employs experienced flooring installers who have retained, and currently hold, an INSTALL Certification, or a certification from a comparable certification program.
 1. Installers to be certified by INSTALL or a comparable certification program with the following minimum criteria:

- a. US Department of Labor approved four (4) year apprenticeship program, 160 hours a year.
- b. Career long training.
- c. Manufacturer endorsed training.
- d. Fundamental journeyman skills certification.

B. Furnish product type materials from the same production run.

1.7 WARRANTY

A. Construction Warranty: Comply with FAR clause 52.246-21, "Warranty of Construction".

1.8 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.

B. ASTM International (ASTM):

D2047-11.....Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine

D2240-05(R2010).....Test Method for Rubber Property—Durometer Hardness

D4078-02(R2008).....Water Emulsion Floor Finish

E648-14c.....Critical Radiant Flux of Floor Covering Systems Using a Radiant Energy Source

E662-14Specific Optical Density of Smoke Generated by Solid Materials

E1155/E1155M-14Determining Floor Flatness and Floor Levelness Numbers

F510/F510M-14Resistance to Abrasion of Resilient Floor Coverings Using an Abrader with a Grit Feed Method

F710-11Preparing Concrete Floors to Receive Resilient Flooring

F925-13Test Method for Resistance to Chemicals of Resilient Flooring

F1344-12(R2013).....Rubber Floor Tile

F1700-13aSolid Vinyl Floor Tile

F1869-11Test Method for Measuring Moisture Vapor Emission Rate
of Concrete Subfloor Using Anhydrous Calcium Chloride

F2170-11Test Method for Determining Relative Humidity in
Concrete Floor Slabs Using in Situ Probes

F2195-13Linoleum Floor Tile

C. Code of Federal Regulation (CFR):

40 CFR 59Determination of Volatile Matter Content, Water Content,
Density Volume Solids, and Weight Solids of Surface
Coating

D. International Standards and Training Alliance (INSTALL):

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Provide adhesives, underlayment, primers, and polish recommended by resilient floor material manufacturer.
- B. Critical Radiant Flux: 0.45 watts per sq. cm or more, Class I, per ASTM E648.
- C. Smoke Density: Less than 450 per ASTM E662.
- D. Slip Resistance – Not less than 0.5 when tested with ASTM D2047.

2.2 LUXURY VINYL TILE

- A. Provide the following: Teknoflor T3 LVT (LVT1, LVT2)
 - 1. Product Standard:
 - a. Printed Film Vinyl Tile
 - b. ASTM F1700, Class III, Type B
 - 2. Thickness: 1/8 inch (3.0 mm)
 - 3. Size: 18 inch x 18 inch (457mm x 457mm)
 - 4. Wear Layer: 23 mil. (0.58mm)
 - 5. Special Coating: Anti-microbial nano-silver in accordance with ASTM F1700-13a.
 - 6. Colors and Patterns: As specified in Section 09 06 00 Schedule for Finishes.
- B. Provide the following: Mannington, The Drift Collection (LVT3)

1. Product Standard:
 - a. Printed Film Vinyl Tile
 - b. ASTM F1700, Class III, Type B
2. Thickness: 0.098" (2.0 mm)
3. Size: 7.25 inch x 48 inch (184mm x 1219mm)
4. Wear Layer: Quantum Guard Elite
5. Colors and Patterns: As specified in Section 09 06 00 Schedule for Finishes.

2.3 ADHESIVES

- A. Provide water resistant type adhesive for flooring, base and accessories as recommended by the manufacturer to suit substrate conditions. VOC content to be less than the 50 grams/L when calculated according to 40 CFR 59 (EPA Method 24). Submit manufacturer's descriptive data, documentation stating physical characteristics, and mildew and germicidal characteristics.

2.4 PRIMER FOR CONCRETE SUBFLOORS

- A. Provide in accordance with Section 09 05 16, SUBSURFACE PREPARATION FOR FLOOR FINISHES.

2.5 LEVELING COMPOUND FOR CONCRETE FLOORS

- A. Provide cementitious products with latex or polyvinyl acetate resins in the mix in accordance with Section 09 05 16, SUBSURFACE PREPARATION FOR FLOOR FINISHES.

2.6 POLISH AND CLEANERS

- A. Cleaners: As recommended in writing by floor tile manufacturer.
- B. Polish: ASTM D4078.

2.7 MOULDING

- A. Provide tapered mouldings of vinyl as indicated on the construction documents for both edges and transitions of flooring materials specified. Provide vertical lip on moulding of maximum 6 mm (1/4 inch). Provide bevel change in level between 6 and 13 mm (1/4 and 1/2 inch) with a slope no greater than 1:2.
- B. Fasteners for Aluminum Mouldings: Stainless steel of type required for substrate condition.

PART 3 - EXECUTION

3.1 ENVIRONMENTAL REQUIREMENTS

- A. Maintain flooring materials and areas to receive resilient flooring at a temperature above 20 degrees C (68 degrees F) for three (3) days before application, during application and two (2) days after application, unless otherwise directed by the flooring manufacturer for the flooring being installed. Maintain a minimum temperature of 13 degrees C (55 degrees F) thereafter. Provide adequate ventilation to remove moisture from area and to comply with regulations limiting concentrations of hazardous vapors.
- B. Do not install flooring until building is permanently enclosed and wet construction in or near areas to receive tile materials is complete, dry and cured.

3.2 SUBFLOOR TESTING AND PREPARATION

- A. Prepare and test surfaces to receive resilient tile and adhesive as per Section 09 05 16, SUBSURFACE PREPARATION FOR FLOOR FINISHES.
- B. Prepare concrete substrates in accordance with ASTM F710.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions for application and installation unless specified otherwise.
- B. Mix tile from at least two containers. An apparent line either of shades or pattern variance is not acceptable.
- C. Tile Layout:
 - 1. If layout is not shown on construction documents, lay tile symmetrically about center of room or space with joints aligned.
 - 2. Vary edge width as necessary to maintain full size tiles in the field, no edge tile to be less than 1/2 the field tile size, except where irregular shaped rooms make it impossible.
 - 3. Alternate direction of floor tile when it is laid
- D. Application:
 - 1. Adhere floor tile to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising

and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

2. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
3. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
4. Roll tile floor with a minimum 45 kg (100 pound) roller.

E. Seal joints at pipes with sealants in accordance with Section 07 92 00, JOINT SEALANTS.

F. Installation of Edge Strips:

1. Locate edge strips under center line of doors unless otherwise shown on construction documents.
2. Set resilient edge strips in adhesive. Anchor metal edge strips with anchors and screws.
3. Where tile edge is exposed, butt edge strip to touch along tile edge.
4. Where thin set ceramic tile abuts resilient tile, set edge strip against floor file and against the ceramic tile edge.

3.4 CLEANING AND PROTECTION

- A. Clean adhesive marks on exposed surfaces during the application of resilient materials before the adhesive sets. Exposed adhesive is not acceptable.
- B. Keep traffic off resilient material for a minimum 72 hours after installation.
- C. Clean flooring as recommended in accordance with manufacturer's printed maintenance instructions and within the recommended time frame. As required by the manufacturer, apply the recommended number of coats and type of polish and/or finish in accordance with manufacturer's written instructions.
- D. When construction traffic occurs over tile, cover resilient materials with reinforced kraft paper properly secured and maintained until removal is directed by COR. At entrances and where wheeled vehicles or carts are used, cover tile with plywood, hardboard, or particle board over paper, secured and maintained until removal is directed by COR.

- E. When protective materials are removed and immediately prior to acceptance, replace damaged tile and mouldings, re-clean resilient materials.

3.5 LOCATION

- A. Unless otherwise indicated in construction documents, install tile flooring, under areas where casework, laboratory and pharmacy furniture and other equipment occur.
- B. Extend tile flooring for room into adjacent closets and alcoves.

--- E N D ---

**SECTION 09 68 00
CARPETING**

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Section specifies carpet, edge strips, adhesives, and other items required for complete installation.

1.2 RELATED WORK

- A. Sustainable Design Requirements: Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.
- B. Manufacturer, Color and Style of Carpet and Edge Strip: Section 09 06 00, SCHEDULE FOR FINISHES.
- C. Resilient Wall Base: Section 09 65 13, RESILIENT BASE AND ACCESSORIES.
- D. Testing of Concrete Floors Before Installation: Section 09 05 16, SUBSURFACE PREPARATION FOR FLOOR FINISHES.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: A company specializing in carpet installation with a minimum three (3) years' experience and employing experienced flooring installers who have retained, and currently hold, an INSTALL Certification, or a certification from a comparable certification program, and a valid OSHA 10 certification.
 - 1. Installers to be certified by INSTALL or a comparable certification program with the following minimum criteria:
 - a. US Department of Labor approved four (4) year apprenticeship program, 160 hours a year.
 - b. Career long training.
 - c. Manufacturer endorsed training.
 - d. Fundamental journeyman skills certification.

1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Sustainable Design Submittals as described below:

1. Volatile organic compounds per volume as specified in PART 2 - PRODUCTS.

C. Product Data:

1. Manufacturer's catalog data and printed documentation stating physical characteristics, durability, resistance to fading and flame resistance characteristics for each type of carpet material and installation accessory.
2. Manufacturer's printed installation instructions for the carpet, including preparation of installation substrate, seaming techniques and recommended adhesives and tapes.

D. Samples:

1. Carpet: "Production Quality" samples 305 x 305 mm (12 x 12 inches) of carpets, showing quality, pattern and color specified in Section 09 06 00, SCHEDULE FOR FINISHES.
2. Floor Edge Strip (Molding): 152 mm (6 inches) long of each color and type specified.
3. Base Edge Strip (Molding): 152 mm (6 inches) long of each color specified.

E. Shop Drawings: Installers layout plan showing seams and cuts for sheet carpet and carpet module.

F. Maintenance Data: Carpet manufacturer's maintenance instructions describing recommended type of cleaning equipment and material, spotting and cleaning methods and cleaning cycles.

G. Installer's Qualifications.

H. Manufacturer's warranty.

1.5 DELIVERY AND STORAGE

- A. Deliver carpet in manufacturer's original wrappings and packages clearly labeled with manufacturer's brand name, size, dye lot number and related information. Transport carpet to job site in a manner that prevents damage and distortion that might render it unusable. When bending or folding is unavoidable for delivery purposes, unfold carpet and lay flat immediately.

- B. Deliver adhesives in containers clearly labeled with manufacturer's brand name, number, installation instructions, safety instructions and flash points.
- C. Store in a clean, dry, well-ventilated area, protected from damage and soiling. Before installation, acclimate carpet to the atmospheric conditions of the areas in which it will be installed for 2 days prior to installation

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Maintain areas in which carpeting is to be installed at a temperature between 18 - 35 degrees C (65 - 95 degrees F) with a maximum relative humidity of 65 percent for two (2) days before installation, during installation and for three (3) days after installation.
- B. Minimum Substrate Surface Temperature: 18 degrees C (65 degrees F) at time of installation.
- C. Three (3) days after installation, maintain minimum temperature of 10 degrees C (50 degrees F) for the duration of the contract.

1.7 WARRANTY

- A. Construction Warranty: Comply with FAR clause 52.246-21, "Warranty of Construction".
- B. Manufacturer Warranty: Manufacturer shall warranty their carpet for a minimum of ten (10) years from date of installation and final acceptance by the Government. Submit manufacturer warranty.

1.8 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to extent referenced.
Publications are referenced in text by basic designation only.
- B. American National Standards Institute (ANSI):
ANSI/NSF 140-10.....Sustainable Carpet Assessment Standard
- C. American Association of Textile Chemists and Colorists (AATCC):
16-04Colorfastness to Light
134-11Electric Static Propensity of Carpets
165-08Colorfastness to Crocking: Textile Floor Coverings-AATCC
Crockmeter Method
174-11Antimicrobial Activity Assessment of New Carpets

D. ASTM International (ASTM):

- D1335-12.....Tuft Bind of Pile Yarn Floor Coverings
- D3278-96(R2011).....Flash Point of Liquids by Small Scale Closed-Cup Apparatus
- D5116-10.....Determinations of Organic Emissions from Indoor
Materials/Products
- D5252-11.....Operation of the Hexapod Tumble Drum Tester
- D5417-11.....Operation of the Vettermann Drum Tester
- E648-14c.....Critical Radiant Flux of Floor-Covering Systems Using a
Radiant Heat Energy Source

E. Code of Federal Regulation (CFR):

- 40 CFR 59Determination of Volatile Matter Content, Water Content,
Density Volume Solids, and Weight Solids of Surface
Coating

F. The Carpet and Rug Institute (CRI):

- CIS.....Carpet Installation Standard

G. International Standards and Training Alliance (INSTALL)

H. International Organization for Standardization (ISO):

- 2551-81Machine-Made Textile Floor Coverings

I. U.S. Consumer Product and Safety Commission (CPSC):

- 16 CFR 1630Surface Flammability of Carpets and Rugs

1.9 EXTRA MATERIALS

- A. Provide an additional five percent (5%) of each color and pattern of carpet tile type as indicated in Section 09 06 00 SCHEDULE FOR FINISHES. Carpet tile shall be of the same dye lot and run as field carpet used on project.
- B. Deliver extra materials in manufacturer's original unopened packaging. Label and store extra materials at the site at a location as directed by the Contracting Officer.

PART 2 - PRODUCTS

2.1 CARPET

- A. Physical Characteristics:

1. Carpet free of visual blemishes, streaks, poorly dyed areas, fuzzing of pile yarn, spots or stains and other physical and manufacturing defects.
2. Type:
 - a. Carpet Construction:
 - CPT1: Textured Patterned Loop
 - CPT2: Patterned Loop
 - MAT1: Patterned Loop
 - b. Carpet Type:
 - CPT1: Modular tile 610 x 610 mm square (24 x 24 inch) with 0.15 percent growth/shrink rate in accordance with ISO 2551.
 - CPT2: Modular tile 610 x 610 mm square (24 x 24 inch) with 0.15 percent growth/shrink rate in accordance with ISO 2551.
 - MAT1: Modular tile 457 x 914 mm rectangle (18 inch x 36 inch) with 0.15 percent growth/shrink rate in accordance with ISO 2551.
 - c. Pile Type: Multilevel loop. Pile type and thickness must conform to ADA requirements.
 - d. Pile Fiber: Commercial 100 percent branded (federally registered trademark), nylon continuous filament.
3. Color: As indicated in Section 09 06 00, SCHEDULE FOR FINISHES.
4. Pattern: As indicated in Section 09 06 0, SCHEDULE FOR FINISHES.
3. Static Control: Provide static control to permanently regulate static buildup to less than 3.5 kV when tested at 20 percent relative humidity and 21 degrees C (70 degrees F) in accordance with AATCC 134.
4. Backing Materials: Provide backing for glue-down installations. For healthcare installations, provide impervious moisture backing that is 100 percent PVC free.
 - a. Modular Tile:
 - 1) Primary Backing/Backcoating: Manufacturer's impervious moisture 100 percent PVC free backing.

- 2) Secondary Backing: Manufacturer's impervious moisture 100 percent PVC free backing.
5. Appearance Retention Rating (ARR): Carpet to be tested and have the minimum 3.5 – 4.0 severe ARR when tested in accordance with either the ASTM D5252 (Hexapod) or ASTM D5417 (Vettermann) test methods using the number of cycles for short and long term tests as specified in the ASTM standard.
6. Tuft Bind: Comply with ASTM D1335 for tuft bind force required to pull a tuft or loop free from carpet backing with a minimum 36 N (8 pound) average force for modular carpet tile.
7. Colorfastness to Crocking: Dry and wet crocking and water bleed, comply with AATCC 165 Color Transference Chart for colors, minimum class 4 rating.
8. Colorfastness to Light (AATCC 16, Option 3): Color change between the exposed and unexposed carpet areas equivalent to a minimum of Grade 4 on the Gray Scale for Color Change after an exposure of 40 AFU (AATCC fading units) for all specified colors.
9. Delamination Strength: Minimum of 440 N/m (2.5 lb./inch) between secondary backing.
10. Flammability and Critical Radiant Flux Requirements:
 - a. Comply with 16 CFR 1630.
 - b. Test Carpet in accordance with ASTM E648.
 - c. Class I: Minimum critical radiant flux of 0.45 watts per square centimeter (2.9 watts per square inch).
 - e. Carpet in corridors, exits and Medical Facilities to be Class I.
11. Average Pile Yarn Density (APYD):
 - a. Corridors, lobbies, entrances, common areas or multipurpose rooms, open offices, waiting areas and dining areas: Minimum APYD 6000.
 - b. Other areas: Minimum APYD 4000.

12. VOC Limits: Use carpet that complies with the following limits for VOC content when tested according to ASTM D5116:

- a. Carpet, Total VOCs: 0.5 mg/sq.m x hr.
- b. Carpet, 4-PC (4-Phenylcyclohexene): 0.05 mg/sq.m x hr.
- c. Carpet, Formaldehyde: 0.05 mg/sq.m x hr.
- d. Carpet, Styrene: 0.4 mg/sq.m x hr.

2.2 ADHESIVE AND CONCRETE PRIMER

- A. Provide water resistant, mildew resistant, nonflammable, and nonstaining adhesives and concrete primers for carpet installation. Provide release adhesive for modular tile carpet as recommended by the carpet manufacturer. Provide adhesives flashpoint of minimum 60 degrees C (140 degrees F) in accordance with ASTM D3278. Materials are to have a VOC maximum of 50 g/L when calculated according to 40 CFR 59, (EPA Method 24).

2.3 SEAMING TAPE

- A. Provide tape for seams as recommended by the carpet manufacturer for the type of seam used in installation. Seam sealant is to have a maximum VOC content of 50 g/L when calculated according to 40 CFR 59, (EPA Method 24). Do not use sealants that contain 1,1,1-trichloroethane or toluene.

2.4 EDGE STRIPS (MOLDING)

- A. Metal:
 - 1. Hammered surface aluminum, pinless, clamp down type designed for the carpet being installed.
 - 2. Floor flange not less than 38 mm (1-1/2 inches) wide, face not less than 16 mm (5/8 inch) wide.
 - 3. Finish: Clear anodic coating unless specified otherwise in Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Vinyl Edge Strip:
 - 1. Beveled floor flange minimum 50 mm (2 inches) wide.

2. Beveled surface to finish flush with carpet for tight joint and other side to floor finish.
3. Color as specified in Section 09 06 00, SCHEDULE FOR FINISHES.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

- A. Contractor to prepare and test surfaces to receive carpet and adhesives as per Section 09 05 16, SUBSURFACE PREPARATION FOR FLOOR FINISHES.

3.2 GENERAL INSTALLATION

- A. Isolate area of installation from rest of building.
- B. Perform all work by manufacturer's approved installers. Conduct installation in accordance with the manufacturer's printed instructions and CRI CIS.
- C. Protect edges of carpet meeting hard surface flooring with molding and install in accordance with the molding manufacturer's printed instructions.
- D. Follow ventilation, personal protection, and other safety precautions recommended by the adhesive manufacturer. Continue ventilation during installation and for at least three (3) days following installation.
- E. Do not permit traffic or movement of furniture or equipment in carpeted area for 24 hours after installation.
- F. Complete other work which would damage the carpet prior to installation of carpet.
- G. Follow carpet manufacturer's recommendations for matching pattern and texture directions.
- H. Cut openings in carpet where required for installing equipment, pipes, outlets, and penetrations. Bind or seal cut edge of sheet carpet. Use additional adhesive to secure carpets around pipes and other vertical projections.
- I. Surplus Material: Provide one piece of surplus field carpet (12' x 24') to the VA. Carpet shall be of same dye lot and run as field carpet used on project.

3.3 MODULAR TILE INSTALLATION

- A. Install per CRI CIS, Adhesive Application.

- B. Lay carpet modules with pile in same direction unless specified otherwise in Section 09 06 00, SCHEDULE FOR FINISHES.
- C. Install carpet modules so that cleaning methods and solutions do not cause dislocation of modules.
- D. Lay carpet modules uniformly to provide tight flush joints free from movement when subject to traffic.

3.4 EDGE STRIPS INSTALLATION

- A. Install edge strips over exposed carpet edges adjacent to uncarpeted finish flooring.
- B. Anchor metal strips to floor with suitable fasteners. Apply adhesive to edge strips, insert carpet into lip and press it down over carpet.
- C. Anchor vinyl edge strip to floor with adhesive. Apply adhesive to edge strip and insert carpet into lip and press lip down over carpet.

3.5 PROTECTION AND CLEANING

- A. Once a carpet installation is complete, clean up scrap materials and debris, and vacuum the area, using manufacturer-approved equipment. Inspect seams carefully for evenness and protruding backing yarns, and inspect the perimeter of the installation for an acceptable finished appearance.
- B. Protect installed carpet if furniture is being moved, by laying plywood, fiberboard or porous non-staining sheeting material for minimum time practical. Based on manufacturer guidelines, protect carpet from rolling or foot traffic. Protect against other materials or renovation or construction activities, including dust, debris, paint, contractor traffic, until it is ready for its final use.
- C. Do not move furniture or equipment on unprotected carpeted surfaces.
- D. Just before final acceptance of work, remove protection and vacuum carpet clean.

--- E N D ---

SECTION 09 72 00
DIGITALLY PRINTED WALL COVERING MURAL

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Section specifies digitally printed wall covering mural and installation.

1.2 RELATED WORK

- A. Sustainable Design Requirements: Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Sustainable Design Submittals, as described below:
 - 1. Volatile organic compounds per volume as specified in PART 2 - PRODUCTS.
- C. Samples:
 - 1. Each type and pattern as specified in Section 09 06 00, SCHEDULE FOR FINISHES.
 - 2. Size: Full width of mill run not less than 450 mm (18 inches) in length.
- D. Manufacturer's Certificates:
 - 1. Compliance with WA W-101.
 - 2. Wall covering manufacturer's approval of adhesive.
- E. Manufacturer's Literature and Data:
 - 1. Wall covering primer and adhesive.
 - 2. Installation instructions.
 - 3. Maintenance instructions, including recommended materials and methods for maintaining wall covering with precautions in use of cleaning material.
 - 4. Adhesive for edge guard.
- F. Tests: Substrate moisture.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver in original unopened containers bearing the manufacturer's name, brand name, and product designation.
- B. Store in accordance with manufacturer's instructions.
- C. Handle to prevent damage to material.

1.6 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to the extent referenced.
Publications are referenced in the text by the basic designation only.
- B. ASTM International (ASTM):
 - a. E84-14Surface Burning Characteristics of Building Materials
- C. Code of Federal Regulation (CFR):
 - a. 40 CFR 59Determination of Volatile Matter Content, Water Content, Density Volume Solids, and Weight Solids of Surface Coating
- D. Wallcovering Association (WA):
 - a. WA-101-2011Quality Standard Polymer Coated Fabric Wallcoverings
- E. Federal Specifications (FedSpec):
 - a. CCC-W-408A.....Wallcovering, Vinyl Coated
- F. Underwriters Laboratory, Inc. (UL)
 - a. UL 723.....Test for Surface Burning Characteristics of Building Materials
- G. National Fire Protection Agency (NFPA)
 - a. NFPA 286.....Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth
 - b. CAN/ULC-S102.....Test for Surface Burning Characteristics of Building Materials and Assemblies.

1.7 WARRANTY

- A. Provide manufacturer's standard performance guarantees or warranties that extend beyond a one-year period.

1.8 SURPLUS MATERIALS

- A. Contractor is to provide one full roll of surplus wall coverings of each type used on the project to the VA. Wall coverings shall be of same dye lot and batch or run as that used on the project.

PART 2 - PRODUCTS

2.1 WALLCOVERINGS AND ACCESSORIES

- A. Provide wall coverings and accessories material designed specifically for the specified use. Provide vinyl wallcovering and borders with a mercury, cadmium, lead, and chromium free base. Protect wall coverings with bactericides and mildew inhibitors against microbiological and mildew growth.

2.2 PRODUCT DATA

- A. Digitally-printed wall covering mural: submit manufacturer's descriptive data, documenting physical characteristics for wall covering.
- B. Accessories: Submit manufacturer's descriptive data for corner guard and/or wainscot cap.
- C. Primer and Adhesive: Submit manufacturer's descriptive data, documenting physical characteristics, mildew, and germicidal characteristics.

2.3 SAMPLES

- A. Digitally Printed Wall Covering Mural
 - a. Provide three samples, 3 yards long by the width specified, of each type to be installed in the work, as required to illustrate material weight, color, shade, design, and embossing when required.
- B. Wall covering Mockup Panels
 - a. After samples are approved and prior to starting installation, provide a minimum 4 foot by 4 foot wall covering mock-up for each color and type of vinyl wallcovering, using the proposed primers and adhesives and actual substrate materials. Once approved by Contracting Officer and/or VA Interior Designer, use the mock-up samples as a standard of workmanship for installation within

the facility. Provide written notification to the Contracting Officer at least 48 hours prior to mock-up installation.

C. Certificates

- a. Submit manufacturer's statement attesting that the product furnished meets or exceeds specification requirements. Date the statement after the award of the contract, state Contractor's name and address, name of the project and location, and list the requirements being certified. Include these certificates:
 - Certified laboratory test reports of the physical properties for vinyl wall covering as specified.
 - Certificates of Compliance for UL fire hazard classification listing, as specified.
 - Certificates of Compliance for contact adhesive.

D. Manufacturer's Instructions

- a. Submit preprinted installation instructions for wall covering and accessories, adhesives, and primers. Include substrate preparation and material application in the instructions.

E. Operations and Maintenance Data

- a. Submit Data Package 1 in accordance with Section 01 00 00 GENERAL REQUIREMENTS.
- b. Submit three copies of manufacturer's maintenance instructions for each type of vinyl wall covering and accessory describing recommended type of cleaning equipment and materials, spotting and cleaning methods, and cleaning cycles. Instructions to also include preventative maintenance, recommended cleaning materials and precautions in the use of cleaning materials.

2.4 DIGITALLY PRINTED WALL COVERING MURAL (WC#)

- A. Custom photography contract to obtain custom images held with the VA.
Materials/substrate, production, and installation held under general contractor scope.
- B. Basis of Design: Koroseal Digital Surfaces Wallcovering, Type II conforming to Federal Specification CCC-W-408A and WA-101-A using test methods given in Federal

Specification CCC-T-191 b except as otherwise specified. Custom images from Koroseal Designer Brand: Kurt Johnson.

- a. Total weight: 21 ounces per linear yard.
 - b. Backing weight: 3.1 ounces per linear yard.
 - c. Vinyl weight: 17.9 ounces per linear yard.
 - d. Thickness: 0.018 to 0.026 inches
 - e. Fabric backing and content: Poly-Cotton Woven
- C. Digital Image: Four custom images of the following areas in Idaho: (Redfish Lake, Sawtooth Mountains, Owyhee Desert, Snake River) or Owner accepted alternate. Architect/VA Interior Designer to select final image. Architect to provide PDF file of image(s) to be digitally printed with UV inks on specified manufacturer's substrate.

2.5 PRIMERS AND ADHESIVES

- A. Provide a type primer and adhesive recommended by the wall covering manufacturer, containing a non-mercury based mildewcide, and complying with local indoor air quality standards. Primer must permit removal of the wall covering and protect the wall surface during removal. Do not damage gypsum wall board facing paper during removal of wall covering. Provide a strippable type adhesive. When substrate color recommendations show through vinyl wall covering, provide a white pigmented primer as recommended by the wall covering manufacturer used to conceal the variations. Provide a recommended type adhesive to install corner guards by the manufacturer of the corner guards.
- B. Adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, (EPA Method 24).

2.6 COLOR, TEXTURE, AND PATTERN

- A. Provide color, texture, and pattern in accordance with Section, 09 06 00 SCHEDULE FOR FINISHES. Color listed is not intended to limit the selection of equal colors from other manufacturers.

PART 3 - EXECUTION

3.1 JOB CONDITIONS

- A. Temperatures:
 - 1. Do not perform work until surfaces and materials have been maintained at minimum of 16 degrees C (60 degrees F) for three (3) days before work begins.
 - 2. Maintain minimum temperatures of 16 degrees C (60 degrees F) until adhesives are dried or cured.
- B. Lighting:
 - 1. Do not proceed unless a minimum lighting level of 15 candela per 0.09 square meter (15 candela per square foot) is provided.
 - 2. Measure light level at mid-height of wall.
- C. Ventilation: Provide continuous ventilation as required to rid the spaces in which the wall coverings are being installed of volatile compounds given off by the wall coverings, sealers and adhesives and as recommended by the product manufacturer for full drying or curing.
- D. Protect other surfaces from damage resulting from installation of wall coverings. Provide drop cloths, shields and protective equipment to prevent primers, adhesives or wall covering from fouling adjacent surfaces and in particular, storage and preparation areas.
- E. Store flammable rubbish, waste, cloths and materials which may constitute a fire hazard, in closed metal containers. Daily remove and properly dispose of flammable wastes from the site.

3.2 SURFACE CONDITION AND PREPARATION

- A. Inspect surfaces to receive wall coverings to assure the following. Notify the Contracting Officer, in writing, of any conditions detrimental to the proper and timely completion of the installation. Work will proceed only when conditions have been corrected and accepted by the installer.
 - 1. Patches and repairs to substrates are completed.
 - 2. Surfaces are clean, smooth and prime painted.

3. Masonry and concrete walls are to have flush joints. Coat these walls with cement plaster or wall/liner as substrate preparation.
- B. Surfaces to receive wall covering are to be dry. Test moisture content of plaster, concrete, and masonry walls with an electric moisture meter. The moisture content is not permitted to be more than 5 percent. Submit test results.
- C. Do not proceed until discovered defects have been corrected by other trades and surfaces are ready to receive wall covering.
- D. Carefully remove electrical outlet and switch plates, mechanical diffusers, escutcheons, registers, surface hardware, fittings and fastenings, prior to starting work and store items for reinstallation.
- E. Finish walls to receive presentation dry erase wall covering to a Level 4 gypsum wallboard finish in accordance with GA 214 unless Level 5 is recommended by the wall covering manufacturer.
- F. Provide interior surfaces of new gypsum wallboard with a wall covering primer in accordance with the manufacturer's printed instructions. As required, use a white primer when substrate color variations are visible through thin or light color wall covering. Prime the surfaces of walls as required by the manufacturer's printed instructions to permit ultimate removal of wall covering from the wall surfaces. Allow primer to completely dry before adhesive application.

3.3 APPLICATION OF ADHESIVE

- A. Mix and apply adhesives in accordance with manufacturer's directions.
- B. Prevent adhesive from getting on face of wall covering.
- C. Apply adhesive to wall covering back.

3.4 INSTALLATION

- A. Install wallcovering in accordance with the manufacturer's printed installation instructions. Remove glue and adhesive spillage from wall covering face and seams with a remover recommended by the manufacturer.
- B. Install material completely adhered, smooth, clean, without wrinkles, air pockets, gaps or overlaps.

- D. Install wall covering before installation of resilient base. Extend wall covering not more than 6 mm (1/4 inch) below top of resilient base.
- E. Contractor is to double cut all seams unless specified otherwise by the wall covering manufacturer.

3.5 CLEANING AND INSTALLING TEMPORARY REMOVED ITEMS

- A. Remove adhesive from wall covering as work proceeds.
- B. Remove adhesives where spilled, splashed or splattered on wall coverings or adjacent surfaces in a manner not to damage surface from which it is removed.
- C. Upon completion of work, leave wall covering free of dirt, soil, stain, or residual film.
- D. Remove all debris associated with wall covering installation.
- E. Reinstall previously removed electrical outlet and switch plates, mechanical diffusers, escutcheons, registers, surface hardware, fittings and fastenings.

3.6 SUBSTITUTIONS

- A. Equal products may be submitted for approval but no less than (10) days prior to bid. Submittals shall include the name and model number of the proposed product being submitted for approval. The manufacture will also include all information specific to the model necessary to corroborate direct compliance with the quality threshold of the specified material.

--- E N D ---

SECTION 09 91 00
PAINTING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the painting and finishing as shown on the construction documents and/or specified herein, including, but not limited to, the following:
1. Prime coats which may be applied in shop under other sections.
 2. Prime painting unprimed surfaces to be painted under this Section.
 3. Painting items furnished with a prime coat of paint, including touching up of or repairing of abraded, damaged or rusted prime coats applied by others.
 4. Painting ferrous metal (except stainless steel) exposed to view.
 5. Painting galvanized ferrous metals exposed to view.
 6. Painting interior concrete block exposed to view.
 7. Painting gypsum drywall exposed to view.
 8. Painting of wood exposed to view, except items which are specified to be painted or finished under other Sections of these specifications. Back painting of all wood in contact with concrete, masonry or other moisture areas.
 9. Painting pipes, pipe coverings, conduit, ducts, insulation, hangers, supports and other mechanical and electrical items and equipment exposed to view.
 10. Painting surfaces above, behind or below grilles, gratings, diffusers, louvers lighting fixtures, and the like, which are exposed to view through these items.
 11. Painting includes shellacs, stains, varnishes, coatings specified, and striping or markers and identity markings.
 12. Incidental painting and touching up as required to produce proper finish for painted surfaces, including touching up of factory finished items.
 13. Painting of any surface not specifically mentioned to be painted herein or on construction documents, but for which painting is obviously necessary to complete the

job, or work which comes within the intent of these specifications, is to be included as though specified.

1.2 RELATED WORK

- A. Activity Hazard Analysis: Section 01 35 26, SAFETY REQUIREMENTS.
- B. Sustainable Design Requirements: Section 01 81 13, SUSTAINABLE DESIGN REQUIREMENTS.
- C. Lead Paint Removal: Section 02 83 33.13, LEAD-BASED PAINT REMOVAL AND DISPOSAL.
- D. Masonry Repairs: Section 04 05 13, MASONRY MORTARING and Section 04 05 16, MASONRY GROUTING.
- E. Shop prime painting of steel and ferrous metals: Division 05 - METALS, Division 08 - OPENINGS; Division 10 - SPECIALTIES; Division 11 - EQUIPMENT; Division 12 - FURNISHINGS; Division 13 – SPECIAL CONSTRUCTION; Division 14 – CONVEYING EQUIPMENT; Division 21 – FIRE SUPPRESSION; Division 22 - PLUMBING; Division 23 – HEATING; VENTILATION AND AIR-CONDITIONING; Division 26 - ELECTRICAL; Division 27 - COMMUNICATIONS; and Division 28 – ELECTRONIC SAFETY AND SECURITY sections.
- F. Prefinished flush doors with transparent finishes: Section 08 14 00, WOOD DOORS.
- G. Type of Finish, Color, and Gloss Level of Finish Coat: Section 09 06 00, SCHEDULE FOR FINISHES.
- H. Glazed wall surfacing or tile like coatings: Section 09 96 59, HIGH-BUILD GLAZED COATINGS.
- I. Multi-color Textured Wall Finish: Section 09 94 19, MULTICOLOR INTERIOR FINISHING.
- J. Asphalt and concrete pavement marking: Section 32 17 23, PAVEMENT MARKINGS.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Sustainable Design Submittals as described below:
 - 1. Volatile organic compounds per volume as specified in PART 2 - PRODUCTS.
- C. Painter qualifications.
- D. Manufacturer's Literature and Data:

1. Before work is started, or sample panels are prepared, submit manufacturer's literature and technical data, the current Master Painters Institute (MPI) "Approved Product List" indicating brand label, product name and product code as of the date of contract award, will be used to determine compliance with the submittal requirements of this specification. The Contractor may choose to use subsequent MPI "Approved Product List", however, only one (1) list may be used for the entire contract and each coating system is to be from a single manufacturer. All coats on a particular substrate must be from a single manufacturer. No variation from the MPI "Approved Product List" where applicable is acceptable.

E. Sample Panels:

1. After painters' materials have been approved and before work is started submit sample panels showing each type of finish and color specified.
2. Panel to Show Color: Composition board, 100 x 250 mm (4 x 10 inch).
3. Panel to Show Transparent Finishes: Wood of same species and grain pattern as wood approved for use, 100 x 250 mm (4 x 10 inch face) minimum, and where both flat and edge grain will be exposed, 250 mm (10 inches) long by sufficient size, 50 x 50 mm (2 x 2 inch) minimum or actual wood member to show complete finish.
4. Attach labels to panel stating the following:
 - a. Federal Specification Number or manufacturers name and product number of paints used.
 - b. Specification code number specified in Section 09 06 00, SCHEDULE FOR FINISHES.
 - c. Product type and color.
 - d. Name of project.
5. Strips showing not less than 50 mm (2 inch) wide strips of undercoats and 100 mm (4 inch) wide strip of finish coat.
6. The VA has established and retains Q-Panels of approved colors used at this facility. The contractor shall submit his Q-Panels to the VA to match approved color and finish sheen.

F. Sample of identity markers if used.

- G. Manufacturers' Certificates indicating compliance with specified requirements:
 - 1. Manufacturer's paint substituted for Federal Specification paints meets or exceeds performance of paint specified.
 - 2. High temperature aluminum paint.
 - 3. Epoxy coating.
 - 4. Intumescent clear coating or fire retardant paint.
 - 5. Plastic floor coating.
- F. Provide a Coating Maintenance Manual: Area summary with finish schedule, area detail designating location where each product/color/finish was used, product data pages, safety data sheets, care and cleaning instruction, touch-up procedures, and color samples of each color and finish used.

1.4 DELIVERY AND STORAGE

- A. Deliver materials to site in manufacturer's sealed container marked to show following:
 - 1. Name of manufacturer.
 - 2. Product type.
 - 3. Batch number.
 - 4. Instructions for use.
 - 5. Safety precautions.
- B. In addition to manufacturer's label, provide a label legibly printed as following:
 - 1. Federal Specification Number, where applicable, and name of material.
 - 2. Surface upon which material is to be applied.
 - 3. Specify Coat Types: Prime; body; finish; etc.
- C. Maintain space for storage, and handling of painting materials and equipment in a ventilated, neat and orderly condition to prevent spontaneous combustion from occurring or igniting adjacent items.
- D. Store materials at site at least 24 hours before using, at a temperature between 18 and 30 degrees C (65 and 85 degrees F).

1.5 QUALITY ASSURANCE

- A. Qualification of Painters: Use only qualified journeyman painters for the mixing and application of paint on exposed surfaces. Submit evidence that key personnel have successfully performed surface preparation and application of coating on a minimum of three (3) similar projects within the past three (3) years.
- B. Paint Coordination: Provide finish coats which are compatible with the prime paints used. Review other Sections of these specifications in which prime paints are to be provided to ensure compatibility of the total coatings system for the various substrates. Upon request from other subcontractors, furnish information on the characteristics of the finish materials proposed to be used, to ensure that compatible prime coats are used. Provide barrier coats over incompatible primers or remove and re-prime as required. Notify the Contracting Officer Representative (COR) in writing of any anticipated problems using the coating systems as specified with substrates primed by others.

1.7 REGULATORY REQUIREMENTS

- A. Paint materials are to conform to the restrictions of the local Environmental and Toxic Control jurisdiction.
1. Volatile Organic Compounds (VOC) Emissions Requirements: Field-applied paints and coatings that are inside the waterproofing system to not exceed limits of authorities having jurisdiction.
 2. Lead-Based Paint:
 - a. Comply with Section 410 of the Lead-Based Paint Poisoning Prevention Act, as amended, and with implementing regulations promulgated by Secretary of Housing and Urban Development.
 - b. Regulations concerning prohibition against use of lead-based paint in federal and federally assisted construction, or rehabilitation of residential structures are set forth in Subpart F, Title 24, Code of Federal Regulations, Department of Housing and Urban Development.
 - c. Do not use coatings having a lead content over 0.06 percent by weight of non-volatile content.

- d. For lead-paint removal, see Section 02 83 33.13, LEAD-BASED PAINT REMOVAL AND DISPOSAL.
- 3. Asbestos: Provide materials that do not contain asbestos.
- 4. Chromate, Cadmium, Mercury, and Silica: Provide materials that do not contain zinc-chromate, strontium-chromate, Cadmium, mercury or mercury compounds or free crystalline silica.
- 5. Human Carcinogens: Provide materials that do not contain any of the ACGIH-BKLT and ACGHI-DOC confirmed or suspected human carcinogens.
- 6. Use high performance acrylic paints in place of alkyd paints.

1.8 SAFETY AND HEALTH

- A. Apply paint materials using safety methods and equipment in accordance with the following:
 - 1. Comply with applicable Federal, State, and local laws and regulations, and with the ACCIDENT PREVENTION PLAN, including the Activity Hazard Analysis (AHA) as specified in Section 01 35 26, SAFETY REQUIREMENTS. The AHA is to include analyses of the potential impact of painting operations on painting personnel and on others involved in and adjacent to the work zone.
- B. Safety Methods Used During Paint Application: Comply with the requirements of SSPC PA Guide 10.
- C. Toxic Materials: To protect personnel from overexposure to toxic materials, conform to the most stringent guidance of:
 - 1. The applicable manufacturer's Material Safety Data Sheets (MSDS) or local regulation.
 - 2. 29 CFR 1910.1000.
 - 3. ACHIH-BKLT and ACGHI-DOC, threshold limit values.

1.9 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by basic designation only.
- B. American Conference of Governmental Industrial Hygienists (ACGIH):

ACGIH TLV-BKLT-2012.....Threshold Limit Values (TLV) for Chemical Substances and
Physical Agents and Biological Exposure Indices (BEIs)

ACGIH TLV-DOC-2012Documentation of Threshold Limit Values and Biological
Exposure Indices, (Seventh Edition)

C. ASME International (ASME):

A13.1-07(R2013)Scheme for the Identification of Piping Systems

D. Code of Federal Regulation (CFR):

40 CFR 59Determination of Volatile Matter Content, Water Content,
Density Volume Solids, and Weight Solids of Surface Coating

E. Commercial Item Description (CID):

A-A-1272APlaster Gypsum (Spackling Compound)

F. Federal Specifications (Fed Spec):

TT-P-1411A.....Paint, Copolymer-Resin, Cementitious (For Waterproofing
Concrete and Masonry Walls) (CEP)

G. Master Painters Institute (MPI):

1Aluminum Paint

4Interior/ Exterior Latex Block Filler

5Exterior Alkyd Wood Primer

7Exterior Oil Wood Primer

8Exterior Alkyd, Flat MPI Gloss Level 1

9Exterior Alkyd Enamel MPI Gloss Level 6

10Exterior Latex, Flat

11Exterior Latex, Semi-Gloss

18Organic Zinc Rich Primer

22Aluminum Paint, High Heat (up to 590° - 1100F)

27Exterior / Interior Alkyd Floor Enamel, Gloss

31Polyurethane, Moisture Cured, Clear Gloss

36Knot Sealer

43Interior Satin Latex, MPI Gloss Level 4

44	.....Interior Low Sheen Latex, MPI Gloss Level 2
45	.....Interior Primer Sealer
46	.....Interior Enamel Undercoat
47	.....Interior Alkyd, Semi-Gloss, MPI Gloss Level 5
48	.....Interior Alkyd, Gloss, MPI Gloss Level 6
50	.....Interior Latex Primer Sealer
51	.....Interior Alkyd, Eggshell, MPI Gloss Level 3
52	.....Interior Latex, MPI Gloss Level 3
53	.....Interior Latex, Flat, MPI Gloss Level 1
54	.....Interior Latex, Semi-Gloss, MPI Gloss Level 5
59	.....Interior/Exterior Alkyd Porch & Floor Enamel, Low Gloss
60	.....Interior/Exterior Latex Porch & Floor Paint, Low Gloss
66	.....Interior Alkyd Fire Retardant, Clear Top-Coat (ULC Approved)
67	.....Interior Latex Fire Retardant, Top-Coat (ULC Approved)
68	.....Interior/ Exterior Latex Porch & Floor Paint, Gloss
71	.....Polyurethane, Moisture Cured, Clear, Flat
77	.....Epoxy Cold Cured, Gloss
79	.....Marine Alkyd Metal Primer
90	.....Interior Wood Stain, Semi-Transparent
91	.....Wood Filler Paste
94	.....Exterior Alkyd, Semi-Gloss
95	.....Fast Drying Metal Primer
98	.....High Build Epoxy Coating
101	.....Epoxy Anti-Corrosive Metal Primer
108	.....High Build Epoxy Coating, Low Gloss
114	.....Interior Latex, Gloss
119	.....Exterior Latex, High Gloss (acrylic)
134	.....Galvanized Water Based Primer
135	.....Non-Cementitious Galvanized Primer

- 138Interior High Performance Latex, MPI Gloss Level 2
- 139Interior High Performance Latex, MPI Gloss Level 3
- 140Interior High Performance Latex, MPI Gloss Level 4
- 141Interior High Performance Latex (SG) MPI Gloss Level 5
- 163Exterior Water Based Semi-Gloss Light Industrial Coating, MPI
Gloss Level 5

G. Society for Protective Coatings (SSPC):

- SSPC SP 1-82(R2004)Solvent Cleaning
- SSPC SP 2-82(R2004)Hand Tool Cleaning
- SSPC SP 3-28(R2004)Power Tool Cleaning
- SSPC SP 10/NACE No.2.....Near-White Blast Cleaning
- SSPC PA Guide 10.....Guide to Safety and Health Requirements

H. Maple Flooring Manufacturer's Association (MFMA):

I. U.S. National Archives and Records Administration (NARA):

- 29 CFR 1910.1000Air Contaminants

J. Underwriter's Laboratory (UL)

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Conform to the coating specifications and standards referenced in PART 3. Submit manufacturer's technical data sheets for specified coatings and solvents.
- B. Where manufacturers' products are specified herein, products of other manufacturers that are considered equivalent to those specified may be used provided they are approved "equal" products.
- C. Paint Systems presently in use and approved at this facility are as follows:
 - 1. Exterior Paint Systems for:
 - a. Masonry or Concrete Walls:
 - 1) Primer Coat: "Sherwin Williams" Loxon® Concrete & Masonry Primer Sealer, A24W8300.

- 2) Body and Finish Coats: "Sherwin Williams" A-100® Exterior Latex Satin, A82 Series, 100% Acrylic. Finish (units @ 60°): 10-20.
- b. Wood Trim and Siding:
 - 1) Primer Coat: "Sherwin Williams" Exterior Latex Wood Primer, B42W8041.
 - 2) Body and Finish Coats: "Sherwin Williams" A-100® Exterior Latex Satin, A82 Series, 100% Acrylic. Finish (units @ 60°): 10-20.
- c. Metal (Light to Moderate Industrial Exposure, i.e. doors, frames, trim, louvers, handrails, etc.):
 - 1) Primer Coat:
 - a) "Sherwin Williams" Extreme Bond, B51W150 Series, Water Based Adhesion Promoting Interior/Exterior, Primer/Sealer (Over previously painted or factory primed surfaces).
 - b) "Sherwin Williams" Kem Kromik® Universal Metal Primer, B50WZ Series, Rust Inhibitive, low VOC. (Over bare ferrous metal only).
 - 2) Body and Finish Coats: "Sherwin Williams" Pro Industrial DTM Waterborne Acrylic Semi-Gloss Coating, B66W1151 Series, 100% Acrylic.
- d. Metal (High Performance Industrial Exposure, i.e. Electrical and Mechanical equipment, etc.):
 - 1) Primer Coat:
 - a) "Sherwin Williams" Extreme Bond, B51W150 Series, Water Based Adhesion Promoting Interior/Exterior, Primer/Sealer (Over previously painted or factory primed surfaces).
 - b) "Sherwin Williams" Kem Kromik® Universal Metal Primer, B50WZ Series, Rust Inhibitive, low VOC. (Over bare ferrous metal only).
 - 2) Body and Finish Coats: "Sherwin Williams" Waterbased Acrolon 100, B65-720 Series, 2-Component, VOC Compliant, Acrylic Polyurethane.
2. Interior Paint Systems for:
 - a. New Gypsum Board or Previously Painted Wall and Ceiling Surfaces (General Use Areas):

- 1) Primer Coat (When required for use by this section): "Sherwin Williams"
PrepRite® ProBlock® Interior/Exterior Latex Primer/Sealer, B51W620.
- b. Body and Finish Coats: "Sherwin Williams" Harmony™ Low Odor Interior Latex Egg
Shell Enamel, Acrylic Latex.
- c. Finish New Gypsum Board or Previously Painted Wall and Ceiling Surfaces (High
Scrubbing and Chemical Exposed Areas – Rooms; [Procedure, Clean Supply, Soiled
Medical Equipment, Housekeeping and Ladder, and Patient/Staff Toilet](#)):
 - 1) Primer Coat (When required for use by this section): "Sherwin Williams"
PrepRite® ProBlock® Interior/Exterior Latex Primer/Sealer, B51W620.
 - 2) Body and Finish Coats: "Sherwin Williams" Pro Industrial® Pre-Catalyzed
Waterbased Epoxy Semi-Gloss K46 Series. Finish (units @ 60°): 55-65.
- d. Wood Trim Work (Painted):
 - 1) Primer Coat: "Sherwin Williams" PrepRite® ProBlock® Interior/Exterior Latex
Primer/Sealer, B51W620.
 - 2) Body and Finish Coats: "Sherwin Williams" ProClassic® Waterborne Acrylic
Semi-Gloss Enamel, B31W1151. Finish (units @ 60°): 35-45.
- e. Wood Trim Work (Stained and Non-stained):
 - 1) Stain (When required for use by this section): Type and color required to match
adjacent work.
 - 2) Body and Finish Coats: "Minwax" Polyacrylic Water Based Varnish, Satin Finish.
- f. Metal (General Purpose unless otherwise specified, i.e. doors, frames, trim, ceiling
fan coil covers, TV brackets, handrails, furniture, lockers, wall and ceiling expansion
joint covers, electrical panel covers, exposed piping, etc.):
 - 1) Primer Coat:
 - a) "Sherwin Williams" Extreme Bond, B51W150 Series, Water Based Adhesion
Promoting Interior/Exterior, Primer/Sealer (Over previously painted or
factory primed surfaces).
 - b) "Sherwin Williams" Kem Kromik® Universal Metal Primer, B50WZ Series,
Rust Inhibitive, low VOC. (Over bare ferrous metal only).

- 2) Body and Finish Coats: "Sherwin Williams" Pro Industrial DTM Waterborne Acrylic Semi-Gloss Coating, B66W1151 Series, 100% Acrylic.
- g. Metal (Toilet/urinal partitions and wall and floor type fan coil and convactor covers.):
 - 1) Primer Coat:
 - a) Contractor shall conduct compatibility test on all surfaces prior to applying body and finish coats. (Over previously painted or factory primed surfaces).
 - b) "Sherwin Williams" Solvent Based Polane Spray Fill, D61A23. (Over bare ferrous metal only).
 - 2) Body and Finish Coats: "Sherwin Williams" Polane® B Polyurethane Gloss Enamel, F63 Series.
(Note: Items to have Polane® B applied must be removed from VA site and sprayed in a controlled environment).
- h. Metal (High Use Areas, i.e. floor grates, floor expansion joint plates, etc.):
 - 1) Primer Coat: "Sherwin Williams" Solvent Based Catalyzed Recoatable Epoxy Primer, B67 Series, 2-Component.
(Note: Contractor shall apply a test area on each different existing finish type and test for solvent attack after proper surface preparation work is completed. If no sign of attack after 24 hours allow one week before testing for adhesion).
 - 2) Body Coat: "Sherwin Williams" ArmorSeal® 1000HS Solvent Based Epoxy Coating, B67 Series, 2-Component.
 - 3) Finish Coat: "Sherwin Williams" ArmorSeal® HS Polyurethane Floor Enamel, B65 Series, 2-Component, (H Pencil Hardness or Greater).
- i. New Masonry or Concrete Walls and Ceilings:
 - 1) Primer Coat: "Sherwin Williams" Loxon® Concrete & Masonry Primer Sealer, A24W8300.
 - 2) Body and Finish Coats: "Sherwin Williams" Harmony™ Low Odor Interior Latex Semi-Gloss Enamel, B10W1051, Vinyl Acrylic. Finish (units @ 60°): 35-45.
- j. Concrete and Terrazzo Floors and Base:

- 1) Primer Coat:
 - a) "Sherwin Williams" ArmorSeal® 1000HS Solvent Based Epoxy Coating, B67 Series, 2-Component, reduced 25% with reducer 54. (Over new concrete surfaces).
- 2) Body Coat: "Sherwin Williams" ArmorSeal® 1000HS Solvent Based Epoxy Coating, B67 Series, 2-Component.
- 3) Finish Coat: "Sherwin Williams" ArmorSeal® HS Polyurethane Floor Enamel, B65 Series, 2-Component, (H Pencil Hardness or Greater).

2.2 PAINT PROPERTIES

- A. Use ready-mixed (including colors), except two component epoxies, polyurethanes, polyesters, paints having metallic powders packaged separately and paints requiring specified additives.
- B. Materials finely ground, uniform in consistency and readily dispersed to form a smooth and homogeneous fluid.
- B. Where no requirements are given in the referenced specifications for primers, use primers with pigment and vehicle, compatible with substrate and finish coats specified.
- C. Provide undercoat paint produced by the same manufacturer as the finish coats. Use only thinners approved by the paint manufacturer, and use only to recommended limits.
- D. VOC Content: For field applications that are inside the weatherproofing system, paints and coating to comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:
 1. Flat Paints and Coatings: 50 g/L.
 2. Non-flat Paints and Coatings: 150 g/L.
 3. Dry-Fog Coatings: 400 g/L.
 4. Primers, Sealers, and Undercoaters: 200 g/L.
 5. Anticorrosive and Antirust Paints applied to Ferrous Metals: 250 g/L.
 6. Zinc-Rich Industrial Maintenance Primers: 340 g/L.
 7. Pretreatment Wash Primers: 420 g/L.

- 8. Shellacs, Clear: 730 g/L.
- 9. Shellacs, Pigmented: 550 g/L.
- E. VOC test method for paints and coatings is to be in accordance with 40 CFR 59 (EPA Method 24). Part 60, Appendix A with the exempt compounds' content determined by Method 303 (Determination of Exempt Compounds) in the South Coast Air Quality Management District's (SCAQMD) "Laboratory Methods of Analysis for Enforcement Samples" manual.

2.3 PLASTIC TAPE

- A. Pigmented vinyl plastic film in colors as specified in Section 09 06 00, SCHEDULE FOR FINISHES or specified.
- B. Pressure sensitive adhesive back.
- C. Snap on coil plastic markers.
- D. Widths as shown on construction documents.

2.4 BIOBASED CONTENT

- A. Paint products shall comply with following bio-based standards for biobased materials:

Material Type	Percent by Weight
Interior Paint	20 percent biobased material
Interior Paint- Oil Based and Solvent Alkyd	67 percent biobased material
Exterior Paint	20 percent biobased material
Wood & Concrete Stain	39 percent biobased content
Polyurethane Coatings	25 percent biobased content
Water Tank Coatings	59 percent biobased content
Wood & Concrete Sealer- Membrane Concrete Sealers	11 percent biobased content
Wood & Concrete Sealer- Penetrating Liquid	79 percent biobased content

- B. The minimum-content standards are based on the weight (not the volume) of the material.

2.5 REGULATORY REQUIREMENTS

- A. Paint materials shall conform to the restrictions of the local Environmental and Toxic Control jurisdiction.
 - 1. Volatile Organic Compounds (VOC): VOC content of paint materials shall not exceed local, state or district requirements.
 - 2. Lead-Base Paint:
 - a. Comply with Section 410 of the Lead-Based Paint Poisoning Prevention Act, as amended, and with implementing regulations promulgated by Secretary of Housing and Urban Development.
 - b. Regulations concerning prohibition against use of lead-based paint in federal and federally assisted construction, or rehabilitation of residential structures are set forth in Subpart F, Title 24, Code of Federal Regulations, Department of Housing and Urban Development.
 - 3. Asbestos: Materials shall not contain asbestos.
 - 4. Chromate, Cadmium, Mercury, Silica: Materials shall not contain zinc-chromate, strontium-chromate, Cadmium, mercury or mercury compounds or silica sand.
 - 5. Human Carcinogens: Materials shall not contain any of the ACGIH-BKLT and ACGHI-DOC confirmed or suspected human carcinogens.

PART 3 - EXECUTION

3.1 JOB CONDITIONS

- A. Safety: Observe required safety regulations and manufacturer's warning and instructions for storage, handling and application of painting materials.
 - 1. Take necessary precautions to protect personnel and property from hazards due to falls, injuries, toxic fumes, fire, explosion, or other harm.
 - 2. Deposit soiled cleaning rags and waste materials in metal containers approved for that purpose. Dispose of such items off the site at end of each day's work.
- B. Atmospheric and Surface Conditions:
 - 1. Do not apply coating when air or substrate conditions are:
 - a. Less than 3 degrees C (5 degrees F) above dew point.

- b. Below 10 degrees C (50 degrees F) or over 35 degrees C (95 degrees F), unless specifically pre-approved by the COR and the product manufacturer. Under no circumstances are application conditions to exceed manufacturer recommendations.
 - c. When the relative humidity exceeds 85 percent; or to damp or wet surfaces; unless otherwise permitted by the paint manufacturer's printed instructions.
- 2. Maintain interior temperatures until paint dries hard.
- 3. Do no exterior painting when it is windy and dusty.
- 4. Do not paint in direct sunlight or on surfaces that the sun will warm.
- 5. Apply only on clean, dry and frost free surfaces except as follows:
 - a. Apply water thinned acrylic and cementitious paints to damp (not wet) surfaces only when allowed by manufacturer's printed instructions.
 - b. Concrete and masonry when permitted by manufacturer's recommendations, dampen surfaces to which water thinned acrylic and cementitious paints are applied with a fine mist of water on hot dry days to prevent excessive suction and to cool surface.
- 6. Varnishing:
 - a. Apply in clean areas and in still air.
 - b. Before varnishing vacuum and dust area.
 - c. Immediately before varnishing wipe down surfaces with a tack rag.

3.2 INSPECTION

- A. Examine the areas and conditions where painting and finishing are to be applied and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.3 GENERAL WORKMANSHIP REQUIREMENTS

- A. Application may be by brush or roller. Spray application only upon acceptance from the COR in writing.

- B. Furnish to the COR a painting schedule indicating when the respective coats of paint for the various areas and surfaces will be completed. This schedule is to be kept current as the job progresses.
- C. Protect work at all times. Protect all adjacent work and materials by suitable covering or other method during progress of work. Upon completion of the work, remove all paint and varnish spots from floors, glass and other surfaces. Remove from the premises all rubbish and accumulated materials of whatever nature not caused by others and leave work in a clean condition.
- D. Remove and protect hardware, accessories, device plates, lighting fixtures, and factory finished work, and similar items, or provide in place protection. Upon completion of each space, carefully replace all removed items by workmen skilled in the trades involved.
- E. When indicated to be painted, remove electrical panel box covers and doors before painting walls. Paint separately and re-install after all paint is dry.
- F. Materials are to be applied under adequate illumination, evenly spread and flowed on smoothly to avoid runs, sags, holidays, brush marks, air bubbles and excessive roller stipple.
- G. Apply materials with a coverage to hide substrate completely. When color, stain, dirt or undercoats show through final coat of paint, the surface is to be covered by additional coats until the paint film is of uniform finish, color, appearance and coverage, at no additional cost to the Government.
- H. All coats are to be dry to manufacturer's recommendations before applying succeeding coats.
- I. All suction spots or "hot spots" in plaster after the application of the first coat are to be touched up before applying the second coat.
- J. Do not apply paint behind frameless mirrors that use mastic for adhering to wall surface.

3.4 SURFACE PREPARATION

- A. General:
 - 1. The Contractor shall be held wholly responsible for the finished appearance and satisfactory completion of painting work. Properly prepare all surfaces to receive paint,

- which includes cleaning, sanding, and touching-up of all prime coats applied under other Sections of the work. Broom clean all spaces before painting is started. All surfaces to be painted or finished are to be completely dry, clean and smooth.
2. See other sections of specifications for specified surface conditions and prime coat.
 3. Perform preparation and cleaning procedures in strict accordance with the paint manufacturer's instructions and as herein specified, for each particular substrate condition.
 4. Clean surfaces before applying paint or surface treatments with materials and methods compatible with substrate and specified finish. Remove any residue remaining from cleaning agents used. Do not use solvents, acid, or steam on concrete and masonry. Schedule the cleaning and painting so that dust and other contaminants from the cleaning process will not fall in wet, newly painted surfaces.
 5. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - a. Concrete: 12 percent.
 - b. Fiber-Cement Board: 12 percent.
 - c. Masonry (Clay and CMU's): 12 percent.
 - d. Wood: 15 percent.
 - e. Gypsum Board: 12 percent.
 - f. Plaster: 12 percent.
- B. Wood:
1. Sand to a smooth even surface and then dust off.
 2. Sand surfaces showing raised grain smooth between each coat.
 3. Wipe surface with a tack rag prior to applying finish.
 4. Surface painted with an opaque finish:
 - a. Coat knots, sap and pitch streaks with MPI 36 (Knot Sealer) before applying paint.
 - b. Apply two coats of MPI 36 (Knot Sealer) over large knots.

5. After application of prime or first coat of stain, fill cracks, nail and screw holes, depressions and similar defects with wood filler paste. Sand the surface to make smooth and finish flush with adjacent surface.
 6. Before applying finish coat, reapply wood filler paste if required, and sand surface to remove surface blemishes. Finish flush with adjacent surfaces.
 7. Fill open grained wood such as oak, walnut, ash and mahogany with MPI 91 (Wood Filler Paste), colored to match wood color.
 - a. Thin filler in accordance with manufacturer's instructions for application.
 - b. Remove excess filler, wipe as clean as possible, dry, and sand as specified.
- C. Ferrous Metals:
1. Remove oil, grease, soil, drawing and cutting compounds, flux and other detrimental foreign matter in accordance with SSPC-SP 1 (Solvent Cleaning).
 2. Remove loose mill scale, rust, and paint, by hand or power tool cleaning, as defined in SSPC-SP 2 (Hand Tool Cleaning) and SSPC-SP 3 (Power Tool Cleaning). Where high temperature aluminum paint is used, prepare surface in accordance with paint manufacturer's instructions.
 3. Fill dents, holes and similar voids and depressions in flat exposed surfaces of hollow steel doors and frames, access panels, roll-up steel doors and similar items specified to have semi-gloss or gloss finish with TT-F-322D (Filler, Two-Component Type, For Dents, Small Holes and Blow-Holes). Finish flush with adjacent surfaces.
 - a. Fill flat head countersunk screws used for permanent anchors.
 - b. Do not fill screws of item intended for removal such as glazing beads.
 4. Spot prime abraded and damaged areas in shop prime coat which expose bare metal with same type of paint used for prime coat. Feather edge of spot prime to produce smooth finish coat.
 5. Spot prime abraded and damaged areas which expose bare metal of factory finished items with paint as recommended by manufacturer of item.
- D. Zinc-Coated (Galvanized) Metal, Aluminum, Copper and Copper Alloys Surfaces Specified Painted:

1. Clean surfaces to remove grease, oil and other deterrents to paint adhesion in accordance with SSPC-SP 1 (Solvent Cleaning).
 2. Spot coat abraded and damaged areas of zinc-coating which expose base metal on hot-dip zinc-coated items with MPI 18 (Organic Zinc Rich Coating). Prime or spot prime with MPI 134 (Waterborne Galvanized Primer) or MPI 135 (Non-Cementitious Galvanized Primer) depending on finish coat compatibility.
- E. Masonry, Concrete, Cement Board, Cement Plaster and Stucco:
1. Clean and remove dust, dirt, oil, grease efflorescence, form release agents, laitance, and other deterrents to paint adhesion.
 2. Use emulsion type cleaning agents to remove oil, grease, paint and similar products. Use of solvents, acid, or steam is not permitted.
 3. Remove loose mortar in masonry work.
 4. Replace mortar and fill open joints, holes, cracks and depressions with new mortar specified in Section 04 05 13, MASONRY MORTARING and Section 04 05 16, MASONRY GROUTING. Do not fill weep holes. Finish to match adjacent surfaces.
 5. Neutralize Concrete floors to be painted by washing with a solution of 1.4 Kg (3 pounds) of zinc sulfate crystals to 3.8 L (1 gallon) of water, allow to dry three (3) days and brush thoroughly free of crystals.
 6. Repair broken and spalled concrete edges with concrete patching compound to match adjacent surfaces as specified in Division 03, CONCRETE Sections. Remove projections to level of adjacent surface by grinding or similar methods.
- F. Gypsum Plaster and Gypsum Board:
1. Remove efflorescence, loose and chalking plaster or finishing materials.
 2. Remove dust, dirt, and other deterrents to paint adhesion.
 3. Fill holes, cracks, and other depressions with CID-A-A-1272A finished flush with adjacent surface, with texture to match texture of adjacent surface. Patch holes over 25 mm (1-inch) in diameter as specified in Section for plaster or gypsum board.

3.5 PAINT PREPARATION

- A. Thoroughly mix painting materials to ensure uniformity of color, complete dispersion of pigment and uniform composition.
- B. Do not thin unless necessary for application and when finish paint is used for body and prime coats. Use materials and quantities for thinning as specified in manufacturer's printed instructions.
- C. Remove paint skins, then strain paint through commercial paint strainer to remove lumps and other particles.
- D. Mix two (2) component and two (2) part paint and those requiring additives in such a manner as to uniformly blend as specified in manufacturer's printed instructions unless specified otherwise.
- E. For tinting required to produce exact shades specified, use color pigment recommended by the paint manufacturer.

3.6 APPLICATION

- A. Start of surface preparation or painting will be construed as acceptance of the surface as satisfactory for the application of materials.
- B. Unless otherwise specified, apply paint in three (3) coats; prime, body, and finish. When two (2) coats applied to prime coat are the same, first coat applied over primer is body coat and second coat is finish coat.
- C. Apply each coat evenly and cover substrate completely.
- D. Allow not less than 48 hours between application of succeeding coats, except as allowed by manufacturer's printed instructions, and approved by COR.
- E. Apply by brush or roller. Spray application for new or existing occupied spaces only upon approval by acceptance from COR in writing.
 - 1. Apply painting materials specifically required by manufacturer to be applied by spraying.
 - 2. In new construction and in existing occupied spaces, where paint is applied by spray, mask or enclose with polyethylene, or similar air tight material with edges and seams continuously sealed including items specified in "Building and Structural Work Field

Painting”; “Work not Painted”; motors, controls, telephone, and electrical equipment, fronts of sterilizes and other recessed equipment and similar prefinished items.

- F. Do not paint in closed position operable items such as access doors and panels, window sashes, overhead doors, and similar items except overhead roll-up doors and shutters.

3.7 PRIME PAINTING

- A. After surface preparation, prime surfaces before application of body and finish coats, except as otherwise specified.
- B. Spot prime and apply body coat to damaged and abraded painted surfaces before applying succeeding coats.
- C. Additional field applied prime coats over shop or factory applied prime coats are not required except for exterior exposed steel apply an additional prime coat.
- D. Prime rabbets for stop and face glazing of wood, and for face glazing of steel.
- E. Wood and Wood Particleboard:
 - 1. Use same kind of primer specified for exposed face surface.
 - a. Exterior wood: MPI 7 (Exterior Oil Wood Primer) for new construction and MPI 5(Exterior Alkyd Wood Primer) for repainting bare wood primer except where MPI 90 (Interior Wood Stain, Semi-Transparent) is scheduled.
 - b. Interior wood except for transparent finish: MPI 45 (Interior Primer Sealer) or MPI 46 (Interior Enamel Undercoat), thinned if recommended by manufacturer.
 - c. Transparent finishes as specified under “Transparent Finishes on Wood Except Floors Article”.
 - 2. Apply two (2) coats of primer MPI 7 (Exterior Oil Wood Primer) or MPI 5 (Exterior Alkyd Wood Primer) or sealer MPI 45 (Interior Primer Sealer) or MPI 46 (Interior Enamel Undercoat) to surfaces of wood doors, including top and bottom edges, which are cut for fitting or for other reason.
 - 3. Apply one (1) coat of primer MPI 7 (Exterior Oil Wood Primer) or MPI 5 (Exterior Alkyd Wood Primer) or sealer MPI 45 (Interior Primer Sealer) or MPI 46 (Interior Enamel Undercoat) as soon as delivered to site to surfaces of unfinished woodwork, except

concealed surfaces of shop fabricated or assembled millwork and surfaces specified to have varnish, stain or natural finish.

4. Back prime and seal ends of exterior woodwork, and edges of exterior plywood specified to be finished.
5. Apply MPI 67 (Interior Latex Fire Retardant, Top-Coat (UL Approved) to wood for fire retardant finish.

F. Metals except boilers, incinerator stacks, and engine exhaust pipes:

1. Steel and iron: MPI 95 (Fast Drying Metal Primer). Use MPI 101 (Cold Curing Epoxy Primer) where MPI 98 (High Build Epoxy Coating) finish is specified.
2. Zinc-coated steel and iron: MPI 135 (Non-Cementitious Galvanized Primer).
3. Aluminum scheduled to be painted: MPI 95 (Fast Drying Metal Primer).
4. Terne Metal: MPI 95 (Fast Drying Metal Primer).
5. Copper and copper alloys scheduled to be painted: MPI 95 (Fast Drying Metal Primer).
6. Machinery not factory finished: MPI 9 (Exterior Alkyd Enamel).
7. Asphalt coated metal: MPI 1 (Aluminum Paint).
8. Metal over 94 degrees C (201 degrees F), Boilers, Incinerator Stacks, and Engine Exhaust Pipes: MPI 22 (High Heat Resistant Coating).

G. Gypsum Board and Hardboard:

1. Surfaces scheduled to have MPI 53 (Interior Latex, Flat) (MPI Gloss Level 1), MPI 52 (Interior Latex, MPI Gloss Level 3), MPI 54 (Interior Latex, Semi-Gloss, MPI Gloss Level 5).
2. Primer: MPI 50 (Interior Latex Primer Sealer) except use MPI 45 (Interior Primer Sealer) in shower and bathrooms.
3. Surfaces scheduled to receive vinyl coated fabric wall covering:
Use MPI 45 (Interior Primer Sealer).
4. Use MPI 98 (High Build Epoxy Coating)

H. Concrete Masonry Units except glazed or integrally colored and decorative units:

1. MPI 4 (Block Filler) on interior surfaces.
2. Prime exterior surface as specified for exterior finishes.

- I. Cement Plaster or stucco Concrete Masonry, Brick Masonry Interior Surfaces of Ceilings and Walls:
 - 1. MPI 53 (Interior Latex, Flat, MPI Gloss Level 1), MPI 52 (Interior Latex, MPI Gloss Level 3), MPI 54 (Interior Latex, Semi-Gloss, MPI Gloss Level 5) except use two (2) coats where substrate has aged less than six (6) months.
 - 2. Use MPI 138 (Interior High Performance Latex, MPI Gloss Level 2), MPI 139 (Interior High Performance Latex, MPI Gloss level 3), MPI 141 (Interior High Performance Latex, MPI Gloss Level 5), MPI 98 (High Build Epoxy Coating), MPI 108 (High Build Epoxy Marine Coating) as scheduled.
- J. Concrete Floors: MPI 68 (Interior/ Exterior Latex Porch & Floor Paint, Gloss). MPI 99 (Water-based Acrylic Curing and Sealing Compound).

3.8 EXTERIOR FINISHES

- A. Apply following finish coats where specified in Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Wood:
 - 1. Do not apply finish coats on surfaces concealed after installation, top and bottom edges of wood doors and sash, or on edges of wood framed insect screens.
 - 2. Two (2) coats of MPI 10 Exterior Latex, Flat) on exposed surfaces, except where transparent finish is specified.
 - 3. Two (2) coats of MPI 31 (Polyurethane, Moisture Cured, Clear Gloss) for transparent finish.
- C. Steel and Ferrous Metal:
 - 1. Two (2) coats of MPI 94 (Exterior Alkyd, Semi-Gloss) on exposed surfaces, except on surfaces over 94 degrees C (201 degrees F).
 - 2. One (1) coat of MPI 22 (High Heat Resistant Coating) on surfaces over 94 degrees K (290 degrees F) and on surfaces of boiler, incinerator, stacks engine exhaust pipes.
- D. Machinery without factory finish except for primer: One (1) coat MPI 8 (Exterior Alkyd, Flat)
- E. Concrete Masonry Units Brick:
 - 1. General:

- a. Where specified in Section 09 06 00, SCHEDULE FOR FINISHES or shown.
 - b. Mix as specified in manufacturer's printed directions.
 - c. Do not mix more paint than can be used within four (4) hours after mixing. Discard paint that has started to set.
 - d. Dampen warm surfaces above 24 degrees C (75 degrees F) with fine mist of water before application of paint. Do not leave free water on surface.
 - e. Cure paint with a fine mist of water as specified in manufacturer's printed instructions.
2. Use two (2) coats of TT-P-1411 (Paint, Co-polymer-Resin, Cementitious), unless specified otherwise.

3.9 INTERIOR FINISHES

- A. Apply following finish coats over prime coats in spaces or on surfaces specified in Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Metal Work:
 1. Apply to exposed surfaces.
 2. Omit body and finish coats on surfaces concealed after installation except electrical conduit containing conductors over 600 volts.
 3. Ferrous Metal, Galvanized Metal, and Other Metals Scheduled:
 - a. Apply two (2) coats of MPI 47 (Interior Alkyd, Semi-Gloss) unless specified otherwise.
 - b. Two (2) coats of MPI 48 (Interior Alkyd Gloss).
 - c. One (1) coat of MPI 46 (Interior Enamel Undercoat) plus one coat of MPI 47 (Interior Alkyd, Semi-Gloss) on exposed interior surfaces of alkyd-amine enamel prime finished windows.
 - e. Machinery: One (1) coat MPI 9 (Exterior Alkyd Enamel).
 - f. Asphalt Coated Metal: One (1) coat MPI 1 (Aluminum Paint).
 - g. Ferrous Metal over 94 degrees K (290 degrees F): Boilers, Incinerator Stacks, and Engine Exhaust Pipes: One (1) coat MPI 22 (High Heat Resistant Coating).
- C. Gypsum Board:

1. One (1) coat of MPI 45 (Interior Primer Sealer) plus one (1) coat of MPI 139 (Interior High Performance Latex, MPI Gloss level 3).
 2. Two (2) coats of MPI 138 (Interior High Performance Latex, MPI Gloss Level 2).
 3. One (1) coat of MPI 45 (Interior Primer Sealer) plus one (1) coat of MPI 54 (Interior Latex, Semi-Gloss, MPI Gloss Level 5) or MPI 114 (Interior Latex, Gloss).
 4. One (1) coat of MPI 45 (Interior Primer Sealer) plus one (1) coat of MPI 48 (Interior Alkyd Gloss).
- D. Masonry and Concrete Walls:
1. Over MPI 4 (Interior/Exterior Latex Block Filler) on CMU surfaces.
 2. Two (2) coats of MPI 54 (Interior Latex, Semi-Gloss, MPI Gloss Level 5)
 3. Two (2) coats of MPI 139 (Interior High Performance Latex, MPI Gloss Level 3)
- E. Cement Board: One (1) coat of MPI 139 (Interior High Performance Latex, MPI Gloss Level 3).
- F. Concrete Floors: One (1) coat of MPI 68 (Interior/ Exterior Latex Porch & Floor Paint, Gloss).
- G. Miscellaneous:
1. Apply where specified in Section 09 06 00, SCHEDULE FOR FINISHES.
 2. MPI 1 (Aluminum Paint): Two (2) coats of aluminum paint.
 4. Interstitial floor markings: One (1) coat MPI 27 (Exterior/ Interior Alkyd Floor Enamel, Gloss

3.10 PAINT COLOR

- A. Color and gloss of finish coats is specified in Section 09 06 00, SCHEDULE FOR FINISHES.
- B. For additional requirements regarding color see Articles, "REFINISHING EXISTING PAINTED SURFACE" and "MECHANICAL AND ELECTRICAL FIELD PAINTING SCHEDULE".
- C. Coat Colors:
1. Color of priming coat: Lighter than body coat.
 2. Color of body coat: Lighter than finish coat.
 3. Color prime and body coats to not show through the finish coat and to mask surface imperfections or contrasts.

D. Painting, Caulking, Closures, and Fillers Adjacent to Casework:

1. Paint to match color of casework where casework has a paint finish.
2. Paint to match color of wall where casework is stainless steel, plastic laminate, or varnished wood.

3.11 MECHANICAL AND ELECTRICAL WORK FIELD PAINTING SCHEDULE

- A. Field painting of mechanical and electrical consists of cleaning, touching-up abraded shop prime coats, and applying prime, body and finish coats to materials and equipment if not factory finished in space scheduled to be finished.
- B. In spaces not scheduled to be finish painted in Section 09 06 00, SCHEDULE FOR FINISHES paint as specified below.
- C. Paint various systems specified in Division 02 – EXISTING CONDITIONS, Division 21 – FIRE SUPPRESSION, Division 22 - PLUMBING, Division 23 – HEATING, VENTILATION AND AIR-CONDITIONING, Division 26 - ELECTRICAL, Division 27 - COMMUNICATIONS, and Division 28 – ELECTRONIC SAFETY AND SECURITY.
- D. Paint after tests have been completed.
- E. Omit prime coat from factory prime-coated items.
- F. Finish painting of mechanical and electrical equipment is not required when located in interstitial spaces, above suspended ceilings, in concealed areas such as pipe and electric closets, pipe basements, pipe tunnels, trenches, attics, roof spaces, shafts and furred spaces except on electrical conduit containing feeders 600 volts or more.
- G. Omit field painting of items specified in “BUILDING AND STRUCTURAL WORK FIELD PAINTING”; “Building and Structural Work not Painted”.
- H. Color:
 1. Paint items having no color specified in Section 09 06 00, SCHEDULE FOR FINISHES to match surrounding surfaces.
 2. Paint colors as specified in Section 09 06 00, SCHEDULE FOR FINISHES except for following:

- a. White: Exterior unfinished surfaces of enameled plumbing fixtures. Insulation coverings on breeching and uptake inside boiler house, drums and drum-heads, oil heaters, condensate tanks and condensate piping.
 - b. Gray: Heating, ventilating, air conditioning and refrigeration equipment (except as required to match surrounding surfaces), and water and sewage treatment equipment and sewage ejection equipment.
 - c. Aluminum Color: Ferrous metal on outside of boilers and in connection with boiler settings including supporting doors and door frames and fuel oil burning equipment, and steam generation system (bare piping, fittings, hangers, supports, valves, traps and miscellaneous iron work in contact with pipe).
 - d. Federal Safety Red: Exposed fire protection piping hydrants, post indicators, electrical conducts containing fire alarm control wiring, and fire alarm equipment.
 - e. Federal Safety Orange: Entire lengths of electrical conduits containing feeders 600 volts or more.
 - f. Color to match brickwork sheet metal covering on breeching outside of exterior wall of boiler house.
- I. Apply paint systems on properly prepared and primed surface as follows:
- 1. Exterior Locations:
 - a. Apply two (2) coats of MPI 94 (Exterior Alkyd, Semi-gloss) to the following ferrous metal items:
Vent and exhaust pipes with temperatures under 94 degrees C(201 degrees F), roof drains, fire hydrants, post indicators, yard hydrants, exposed piping and similar items.
 - b. Apply two (2) coats MPI 11 (Exterior Latex, Semi-Gloss) to galvanized and zinc-copper alloy metal.
 - c. Apply one (1) coat of MPI 22 (High Heat Resistant Coating), 650 degrees C (1200 degrees F) to incinerator stacks, boiler stacks, and engine generator exhaust.
 - 2. Interior Locations:
 - a. Apply two (2) coats of MPI 47 (Interior Alkyd, Semi-Gloss) to following items:

- 1) Metal under 94 degrees C (201 degrees F) of items such as bare piping, fittings, hangers and supports.
- 2) Equipment and systems such as hinged covers and frames for control cabinets and boxes, cast-iron radiators, electric conduits and panel boards.
- 3) Heating, ventilating, air conditioning, plumbing equipment, and machinery having shop prime coat and not factory finished.
- c. Apply one (1) coat of MPI 50 (Interior Latex Primer Sealer) and one (1) coat of MPI 44 (Interior Low Sheen Latex) on finish of insulation on boiler breeching and uptakes inside boiler house, drums, drumheads, oil heaters, feed water heaters, tanks and piping.
- d. Apply two (2) coats of MPI 22 (High Heat Resistant Coating) to ferrous metal surface over 94 degrees K (290 degrees F) of following items:
 - 1) Garbage and trash incinerator.
 - 2) Medical waste incinerator.
 - 3) Exterior of boilers and ferrous metal in connection with boiler settings including supporting members, doors and door frames and fuel oil burning equipment.
 - 4) Steam line flanges, bare pipe, fittings, valves, hangers and supports over 94 degrees K (290 degrees F).
 - 5) Engine generator exhaust piping and muffler.
- e. Paint electrical conduits containing cables rated 600 volts or more using two (2) coats of MPI 94 (Exterior Alkyd, Semi-gloss) in the Federal Safety Orange color in exposed and concealed spaces full length of conduit.
3. Other exposed locations:
 - a. Metal surfaces, except aluminum, of cooling towers exposed to view, including connected pipes, rails, and ladders: Two (2) coats of MPI 1 (Aluminum Paint).
 - b. Cloth jackets of insulation of ducts and pipes in connection with plumbing, air conditioning, ventilating refrigeration and heating systems: One (1) coat of MPI 50 (Interior Latex Primer Sealer) and one (1) coat of MPI 11 (Exterior Latex Semi-Gloss).

3.12 BUILDING AND STRUCTURAL WORK FIELD PAINTING

- A. Painting and finishing of interior and exterior work except as specified here-in-after.
 - 1. Painting and finishing of new work including colors and gloss of finish selected is specified in Finish Schedule, Section 09 06 00, SCHEDULE FOR FINISHES.
 - 2. Painting of disturbed, damaged and repaired or patched surfaces when entire space is not scheduled for complete repainting or refinishing.
 - 3. Painting of ferrous metal and galvanized metal.
 - 4. Painting of wood with fire retardant paint exposed in attics, when used as mechanical equipment space (except shingles).
 - 5. Identity painting and safety painting.
- B. Building and Structural Work not Painted:
 - 1. Prefinished items:
 - a. Casework, doors, elevator entrances and cabs, metal panels, wall covering, and similar items specified factory finished under other sections.
 - b. Factory finished equipment and pre-engineered metal building components such as metal roof and wall panels.
 - 2. Finished surfaces:
 - a. Hardware except ferrous metal.
 - b. Anodized aluminum, stainless steel, chromium plating, copper, and brass, except as otherwise specified.
 - c. Signs, fixtures, and other similar items integrally finished.
 - 3. Concealed surfaces:
 - a. Inside dumbwaiter, elevator and duct shafts, interstitial spaces, pipe basements, crawl spaces, pipe tunnels, above ceilings, attics, except as otherwise specified.
 - b. Inside walls or other spaces behind access doors or panels.
 - c. Surfaces concealed behind permanently installed casework and equipment.
 - 4. Moving and operating parts:
 - a. Shafts, chains, gears, mechanical and electrical operators, linkages, and sprinkler heads, and sensing devices.

- b. Tracks for overhead or coiling doors, shutters, and grilles.
- 5. Labels:
 - a. Code required label, such as Underwriters Laboratories Inc., Intertek Testing Service or Factory Mutual Research Corporation.
 - b. Identification plates, instruction plates, performance rating, and nomenclature.
- 6. Galvanized metal:
 - a. Exterior chain link fence and gates, corrugated metal areaways, and gratings.
 - b. Gas Storage Racks.
 - c. Except where specifically specified to be painted.
- 7. Metal safety treads and nosings.
- 8. Gaskets.
- 9. Concrete curbs, gutters, pavements, retaining walls, exterior exposed foundations walls and interior walls in pipe basements.
- 10. Face brick.
- 11. Structural steel encased in concrete, masonry, or other enclosure.
- 12. Structural steel to receive sprayed-on fire proofing.
- 13. Ceilings, walls, columns in interstitial spaces.
- 14. Ceilings, walls, and columns in pipe basements.
- 15. Wood Shingles.

3.13 IDENTITY PAINTING SCHEDULE

- A. Identify designated service in new buildings or projects with extensive remodeling in accordance with ASME A13.1, unless specified otherwise, on exposed piping, piping above removable ceilings, piping in accessible pipe spaces, interstitial spaces, and piping behind access panels. For existing spaces where work is minor match existing.
 - 1. Legend may be identified using snap-on coil plastic markers or by paint stencil applications.
 - 2. Apply legends adjacent to changes in direction, on branches, where pipes pass through walls or floors, adjacent to operating accessories such as valves, regulators, strainers

and cleanouts a minimum of 12.2 M (40 feet) apart on straight runs of piping.

Identification next to plumbing fixtures is not required.

3. Locate Legends clearly visible from operating position.
4. Use arrow to indicate direction of flow using black stencil paint.
5. Identify pipe contents with sufficient additional details such as temperature, pressure, and contents to identify possible hazard. Insert working pressure shown on construction documents where asterisk appears for High, Medium, and Low Pressure designations as follows:
 - a. High Pressure - 414 kPa (60 psig) and above.
 - b. Medium Pressure - 104 to 413 kPa (15 to 59 psig).
 - c. Low Pressure - 103 kPa (14 psig) and below.
 - d. Add Fuel oil grade numbers.
6. Legend name in full or in abbreviated form as follows:

PIPING	COLOR OF EXPOSED PIPING	COLOR OF BACKGROUND	COLOR OF LETTERS	LEGEND ABBREVIATIONS
Blow-off		Green	White	Blow-off
Boiler Feedwater		Green	White	Blr Feed
A/C Condenser Water Supply		Green	White	A/C Cond Wtr Sup
A/C Condenser Water Return		Green	White	A/C Cond Wtr Ret
Chilled Water Supply		Green	White	Ch. Wtr Sup
Chilled Water Return		Green	White	Ch. Wtr Ret
Shop Compressed Air		Blue	White	Shop Air
Air-Instrument Controls		Green	White	Air-Inst Cont
Drain Line		Green	White	Drain
Emergency Shower		Green	White	Emg Shower
High Pressure Steam		Green	White	H.P. _____*
High Pressure Condensate Return		Green	White	H.P. Ret _____*
Medium Pressure Steam		Green	White	M. P. Stm _____*
Medium Pressure Condensate				

CONSTRUCT PRIMARY CARE / MENTAL HEALTH BUILDING
BOISE VA MEDICAL CENTER - BOISE, ID

PROJECT #: 531-325
CONSTRUCTION DOCUMENTS

Return		Green	White	M.P. Ret _____*
Low Pressure Steam		Green	White	L.P. Stm _____*
Low Pressure Condensate				
Return		Green	White	L.P. Ret _____*
High Temperature Water				
Supply		Green	White	H. Temp Wtr Sup
High Temperature Water				
Return		Green	White	H. Temp Wtr Ret
Hot Water Heating Supply		Green	White	H. W. Htg Sup
Hot Water Heating Return		Green	White	H. W. Htg Ret
Gravity Condensate Return		Green	White	Gravity Cond Ret
Pumped Condensate Return		Green	White	Pumped Cond Ret
Vacuum Condensate Return		Green	White	Vac Cond Ret
Fuel Oil		Brown	White	Fuel Oil
(Diesel Fuel included under Fuel Oil)				
Boiler Water Sampling		Green	White	Sample
Chemical Feed		Green	White	Chem Feed
Continuous Blow-Down		Green	White	Cont. B D
Pumped Condensate		Green	White	Pump Cond
Pump Recirculating		Green	White	Pump-Recirc.
Vent Line		Green	White	Vent
Alkali		Orange	Black	Alk
Bleach		Orange	Black	Bleach
Detergent		Yellow	Black	Det
Liquid Supply		Yellow	Black	Liq Sup
Reuse Water		Yellow	Black	Reuse Wtr
Cold Water (Domestic)	White	Green	White	C.W. Dom
Hot Water (Domestic)				
Supply	White	Yellow	Black	H.W. Dom
Return	White	Yellow	Black	H.W. Dom Ret
Tempered Water	White	Yellow	Black	Temp. Wtr
Ice Water				
Supply	White	Green	White	Ice Wtr
Return	White	Green	White	Ice Wtr Ret
Reagent Grade Water		Green	White	RG

Reverse Osmosis		Green	White	RO
Sanitary Waste		Green	White	San Waste
Sanitary Vent		Green	White	San Vent
Storm Drainage		Green	White	St Drain
Pump Drainage		Green	White	Pump Disch
Chemical Resistant Pipe				
Waste		Orange	Black	Acid Waste
Vent		Orange	Black	Acid Vent
Atmospheric Vent		Green	White	ATV
Silver Recovery		Green	White	Silver Rec
Oral Evacuation		Green	White	Oral Evac
Fuel Gas		Yellow	Black	Gas
Fire Protection Water				
Sprinkler	Red	Red	White	Auto Spr
Standpipe	Red	Red	White	Stand
Sprinkler	Red	Red	White	Drain
Hot Water Supply Dom./				
Solar Water		Green	White	H.W. Sup Dom/SW
Hot Water Return Dom./				
Solar Water		Green	White	H.W. Ret Dom/SW

7. Electrical Conduits containing feeders over 600 volts, paint legends using 50 mm (2 inch) high black numbers and letters, showing the voltage class rating. Provide legends where conduits pass through walls and floors and at maximum 6096 mm (20 foot) intervals in between. Use labels with yellow background with black border and words Danger High Voltage Class, 5000
8. See Sections for methods of identification, legends, and abbreviations of the following:
 - a. Regular compressed air lines: Section 22 15 00, GENERAL SERVICE COMPRESSED-AIR SYSTEMS.
 - b. Dental compressed air lines: Section 22 61 13.74, DENTAL COMPRESSED-AIR PIPING / Section 22 61 19.74, DENTAL COMPRESSED-AIR EQUIPMENT.
 - c. Laboratory gas and vacuum lines: Section 22 62 00, VACUUM SYSTEMS FOR LABORATORY AND HEALTHCARE FACILITIES / Section 22 63 00, GAS SYSTEMS FOR LABORATORY AND HEALTHCARE FACILITIES.

- d. Oral evacuation lines: Section 22 62 19.74, DENTAL VACUUM AND EVACUATION EQUIPMENT.
 - e. Medical Gases and vacuum lines: Section 22 62 00, VACUUM SYSTEMS FOR LABORATORY AND HEALTHCARE FACILITIES / Section 22 63 00, GAS SYSTEMS FOR LABORATORY AND HEALTHCARE FACILITIES.
 - f. Conduits containing high voltage feeders over 600 volts: Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS / Section 27 05 33, RACEWAYS AND BOXES FOR COMMUNICATIONS SYSTEMS / Section 28 05 33, RACEWAYS AND BOXES FOR ELECTRONIC SAFETY AND SECURITY.
- B. Fire and Smoke Partitions:
- 1. Identify partitions above ceilings on both sides of partitions except within shafts in letters not less than 64 mm (2 1/2 inches) high.
 - 2. Stenciled message: "SMOKE BARRIER" or "FIRE BARRIER" as applicable.
 - 3. Locate not more than 6096 mm (20 feet) on center on corridor sides of partitions, and with a least one (1) message per room on room side of partition.
 - 4. Use semi-gloss paint of color that contrasts with color of substrate.
- C. Identify columns in pipe basements and interstitial space:
- 1. Apply stenciled number and letters to correspond with grid numbering and lettering indicated on construction documents.
 - 2. Paint numbers and letters 101 mm (4 inches) high, locate 45 mm (18 inches) below overhead structural slab.
 - 3. Apply on four (4) sides of interior columns and on inside face only of exterior wall columns.
 - 4. Color:
 - a. Use black on concrete columns.
 - b. Use white or contrasting color on steel columns.

3.14 PROTECTION CLEAN UP, AND TOUCH-UP

- A. Protect work from paint droppings and spattering by use of masking, drop cloths, removal of items or by other approved methods.

- B. Upon completion, clean paint from hardware, glass and other surfaces and items not required to be painted of paint drops or smears.
- C. Before final inspection, touch-up or refinished in a manner to produce solid even color and finish texture, free from defects in work which was damaged or discolored.

--- E N D ---

SECTION 10 11 23
TACKBOARDS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies bulletin boards and glass door bulletin boards, which include tackboards and related items.

1.2 RELATED WORK

- A. Sustainable Design Requirements: Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.
- B. Manufacturer, Color, and Style Tackboard: Section 09 06 00, SCHEDULE FOR FINISHES

1.3 QUALITY ASSURANCE

- A. Provide bulletin boards that are the product of one (1) manufacturer that has provided bulletin boards as specified for a minimum of three (3) years.

1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.
- B. Sustainable Design Submittals, as described below:
 - 1. Volatile organic compounds per volume as specified in PART 2 - PRODUCTS.
 - 2. For composite wood products, submit documentation indicating product contains no urea formaldehyde
- C. Shop Drawings: Identifying all parts by name and material and showing design, construction, installation, anchorage and relation to adjacent construction.
- D. Manufacturer's Literature and Data:
 - 1. Bulletin board.
 - 2. Glass door bulletin board.
- E. Samples:
 - 1. Tackboard material, 6 x 6 inches, each color, mounted on backing.
 - 2. Frame material, 6 inch length.
- F. Manufacturer's qualifications.

1.5 WARRANTY

- A. Construction Warranty: Comply with FAR clause 52.246-21, "Warranty of Construction".

1.6 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced.

The publications are referenced in the text by the basic designation only.

- B. American Architectural Manufacturers Association (AAMA):

611-14Anodized Architectural Aluminum

2603-13Voluntary Specification, Performance Requirements and
Test Procedures for Pigmented Organic Coatings on
Aluminum Extrusions and Panels

- C. American National Standards Institute (ANSI):

Z97.1-09Safety Glazing Materials Used in Buildings - Safety
Performance Specifications and Methods of Test

- D. ASTM International (ASTM):

B221 -14Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire,
Shapes and Tubes

B221M-13.....Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire,
Shapes and Tubes (Metric)

B429/B429M-10(R2012)Aluminum-Alloy Extruded Structural Pipe and Tube

C208-12Cellulosic Fiber Insulation Board

C1036-11(R2012)Flat Glass

C1048-12Heat-Treated Flat Glass-Kind HS, Kind FT Coated and
Uncoated Glass

F104-03(R2009).....Nonmetallic Gasket Materials

- E. Code of Federal Regulation (CFR):

40 CFR 59Determination of Volatile Matter Content, Water Content,
Density Volume Solids, and Weight Solids of Surface
Coating

- F. Composite Panel Association (CPA):

A208.1-09.....Particleboard

A135.4-12.....Basic Hardboard

G. National Association of Architectural Metal Manufacturers (NAAMM):

AMP 500 SeriesMetal Finishes Manual

AMP 501.....Finishes for Aluminum

PART 2 - PRODUCTS

2.1 BULLETIN BOARD

- A. Provide bulletin board that consists of a tackboard, snap on aluminum frame and grounds.

2.2 GLASS DOOR BULLETIN BOARD

- A. General: Factory-fabricated unit consisting of manufacturer's standard wall-mounted cabinet with natural cork tackboard panel on back inside surface and operable glazed doors at front.
- B. Aluminum-Framed Cabinet: Extruded aluminum.
- C. Glazed Sliding Doors: Tempered glass; unframed; with extruded-aluminum top and bottom track; supported on nylon or ball-bearing rollers; with plastic top guide and rubber bumpers. Equip each door with ground finger pull and adjustable cylinder lock with two keys.
- D. Illumination System: Concealed top-lighting system consisting of fluorescent-strip or LED fixtures. Include lamps and internal wiring with single, concealed electrical connection to building system.

2.3 MATERIALS

- A. Hardboard: ANSI A135.4, tempered.
- B. Fiberboard: ASTM C208.
- C. Particleboard: ANSI A208.1, Grade M-1.
- D. Hardwood Plywood: HPVA HP-1.
- E. Natural-Cork Sheet: Seamless, single-layer, compressed fine-grain cork sheet; bulletin board quality; face sanded for natural finish.
- F. Extruded-Aluminum Bars and Shapes: ASTM B221M (ASTM B221), Alloy 6063.
- G. Aluminum Tubing: ASTM B429/B429M, Alloy 6063.

- H. Clear Tempered Glass: ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality Q3, with exposed edges seamed before tempering.
- I. Fasteners: Provide screws, bolts, and other fastening devices made from same material as items being fastened, except provide hot-dip galvanized, stainless-steel, or aluminum fasteners for exterior applications. Provide types, sizes, and lengths to suit installation conditions. Provide security fasteners where exposed to view.
- J. Adhesives:
 - 1. Adhesives for Field Application: Mildew-resistant, nonstaining adhesive for use with specific type of panels, sheets, or assemblies; and for substrate application; as recommended in writing by visual display unit manufacturer.
 - 2. Adhesives to have VOC content of 50g/L or less when calculated according to 40 CFR 59 (EPA Method 24).

2.4 COMPONENTS

- A. Tackboard: Cork face, 1/4-inch thick factory laminated to a hardboard or particleboard backing.
- B. Frames (Trim): Extruded aluminum, 0.060-inch thick, snap-on type, approximate face width 1-3/4 inch, depth and configuration as required to return to wall and engage clips.
- C. Display Rail: Snap-on type, same materials as frames, approximate face width 1 inch with 1/4-inch thick cork insert.
- D. Mullions: Snap-on type, same material and face width as frames, designed to finish flush with frame.
- E. Grounds: Continuous zinc-coated (galvanized) steel or extruded aluminum members designed to support the tackboard and clips for snap-on frames, and map rail.
- F. Clips: Manufacturer's standard as required to support frame, mullions, and display rail.
- G. Tubular Frame (For glass door bulletin board): Extruded aluminum, 0.092 inches thick; tubular or open back in section, with flanges for concealed attachment, designed to support door hardware and tackboard.

- H. Provide bulletin boards 12 feet or less in length in one (1) piece. Provide larger units with one (1) joint at center. Fabricate joints with metal spline, with faces in same plane and edges that touch along entire length.

2.5 FABRICATION

- A. Fabricate bulletin boards to dimensions indicated on construction documents, and as specified for dimensions, design, and thickness and finish of materials.
- B. Provide metals and shapes of thickness and reinforcement required to produce flat surfaces, and to impart strength for size, design, and application.
- C. Fabricate cabinets and door frames with reinforced corners, mitered to a hairline fit, with no exposed fasteners.
- D. Grind metal edges smooth.

2.6 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM AMP 500 Series for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: 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.

2.7 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.4 mil) or thicker.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Install units in accordance with the manufacturer's installation instructions with concealed fasteners.
- B. Inspect surfaces and related construction to receive units. Verify reinforcement and blocking has been provided in partitions before installation.
- C. Install units as specified by the manufacturer.
- D. Grounds Designed to Receive Clips for Snap-On Trim: Continuous and be secured 12 inches on center.

- E. Miter trim at corners, conceal fasteners. Modify trim as required to conform to surrounding construction details.

3.2 INSTALLATION OF GLASS DOOR BULLETIN BOARDS

- A. Glass door bulletin board units to be factory assembled, except tackboard may be either field mounted or shop mounted on frame.
- B. Mounting bolts or screws to be oval head of stainless steel, chromium plated steel.
Space fasteners 20 inches on center, except not less than three fasteners each side, top and bottom. Heads of fasteners are not to show on the frame face.

3.3 CLEANING

- A. Clean tackboards in accordance with manufacturer's written instructions.
- B. Touch-up factory applied finishes restoring damaged or soiled areas.

--- E N D ---

**SECTION 10 13 00
DIRECTORIES**

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies interior and exterior directories.

1.2 RELATED WORK

- A. Electrical Work: Division 26, ELECTRICAL.
- B. Section 10 14 00, SIGNAGE.
- C. Manufacturer, Color and Style: Section 09 06 00, SCHEDULE FOR FINISHES.

1.3 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Provide directories that are the product of a single manufacturer, that has provided units as specified for a minimum of three (3) years.

1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 00, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.
- B. Samples: Directory panels and frames, with letters and symbols, each type.
 - 1. Color samples of each color, 6 inches x 6 inches. Show anticipated range of color and texture.
 - 2. Sample of typeface, arrow and symbols in a typical full size layout.
- C. Manufacturer's Literature:
 - 1. Manufacturer's printed specifications, anchorage details, installation and maintenance instructions.
 - 2. Manufacturer's qualifications.
- D. Directory location plan showing location and type of each directory.

1.5 DELIVERY AND STORAGE

- A. Deliver materials to job in manufacturer's original sealed containers with brand name markings. Protect materials from damage.

- B. Package to prevent damage or deterioration during shipment, handling, storage and installation. Maintain protective covering in place and in good repair until removal is necessary.
- C. Deliver directories only when the site and mounting services are ready for installation work to proceed.
- D. Store products in dry condition inside enclosed facilities.

1.6 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. ASTM International (ASTM):
 - A666-10.....Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar
 - B209-14.....Aluminum and Aluminum-Alloy Sheet and Plate
 - B209M-14.....Aluminum and Aluminum-Alloy Sheet and Plate (Metric)
 - B221-14.....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
 - B221M-13.....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes (Metric)
 - C1036-11e1.....Flat Glass
 - C1048-12e1.....Heat-Strengthened and Fully Tempered Flat Glass
 - D1003-13.....Haze and Luminous Transmittance of Transparent Plastics
 - D4802-10.....Poly(Methyl Methacrylate) Acrylic Plastic Sheet
- C. American Architectural Manufacturers Association (AAMA):
 - 611-14.....Anodized Architectural Aluminum
 - 2603-13.....Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels
- D. National Association of Architectural Metal Manufacturers (NAAMM):

AMP 500 SeriesMetal Finishes Manual

E. Federal Specifications (Fed Spec):

MIL-PRF-8184FPlastic Sheet, Acrylic, Modified.

MIL-P-46144C.....Plastic Sheet, Polycarbonate

F. National Fire Protection Association (NFPA):

70-14National Electric Code

PART 2 - PRODUCTS

2.1 DIRECTORY TYPE

A. Non-Illuminated Message Strip Directories:

1. Profiled Frame: Molded acrylic profiled frame at top and bottom, with sheet metal rear cover, housing changeable message.

B. Rear Illuminated Message Strip Directories:

1. Factory fabricated unit consisting of changeable message strips held in place by retainer frame enclosed manufacturer's standard perimeter frame with glazed cover, aluminum sheet rear cover panel, and concealed rear-illumination system.
2. Exterior Directories: Metal framed directories of weather resistant construction.
3. Rear Illumination System: Provide removable and accessible LED

2.2 MATERIALS

A. Aluminum:

1. Sheet and Plate: ASTM B209M (B209).
2. Extrusions and Tubing: ASTM B221M (B221) Alloy 6063.

B. Stainless Steel Sheet: ASTM A666, Type 304.

C. Clear Float Glass: ASTM C1036, Type I, Class 1, Quality q3.

D. Clear Tempered Glass: ASTM C1048, Kind FT, Condition A, Type I, Class 1 (clear) Quality q3 with exposed edges seamed before tempering.

E. Clear Acrylic Sheet: ASTM D4802, Category A-1 (cell cast sheet) with Finish 1 (smooth or polished) colorless sheet with visible light transmittance of 92 percent measured according to ASTM D1003.

- F. Fasteners: Provide screws, bolts, and other fastening devices made from same material as items being fastened except provide hot dipped galvanized, stainless steel, or aluminum fasteners for exterior applications.
- G. Electrical Components: Listed and labeled as defined in NFPA 70, by a qualified testing agency.

2.3 FABRICATION

- A. Fabricate directories to requirements indicated for dimensions, design, and thickness and finish of materials. Provide metals and shapes of thickness and reinforcement to produce flat surfaces, free of oil canning.
- B. Fabricate directory cabinets and door frames with reinforced corners, mitered and welded to a hairline fit, with no exposed fasteners. Provide structural reinforcement to prevent racking and misalignment.
- C. Message-Strip Directories: Provide message strips with wording and other designations for the locations where wording is indicated. Include blank message strips as needed to fill out remainder of directory.
- D. Provide hold-open arms for doors of top-hinged directories.

2.4 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM AMP 500 for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: 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.

2.5 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.70 mils or thicker.
- B. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.70 mils or thicker.
- C. Baked Enamel or Powder-Coat Finish: AAMA 2603 except with minimum dry film thickness of 1.5 mils.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install directories in locations and at mounting heights indicated on construction documents and approved shop drawings. Keep perimeter lines straight, level, and plumb.
- B. Recessed Directories: Attach directories to wall framing with fasteners at not more than 16 inches centers. Attach aluminum trim over edges of recessed directories, and conceal grounds and clips.
- C. Surface-Mounted Directories: Attach directories to wall surfaces with concealed clips, hangers, or grounds fastened at not more than 16 inches o.c. Secure both top and bottom of directories to walls.

3.2 ADJUSTING AND CLEANING

- A. Adjust directory doors to operate smoothly without warp or bind and so that contact points meet accurately. Lubricate operating hardware as recommended by manufacturer.
- B. Touch up factory-applied finishes to restore damaged or soiled areas.

- - - END - - -

SECTION 10 14 00
SIGNAGE

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies interior signage for room numbers, directional signs and code required signs.
- B. This section specifies exterior signage.

1.2 RELATED WORK

- A. Sustainable Design Requirements: Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS
- B. Lighted EXIT signs for egress purposes are specified under Division 26, ELECTRICAL.
- C. Color and Finish of Interior Signs: Section 09 06 00, SCHEDULE FOR FINISHES.
- D. Concrete Post Footings: Section 03 30 53, MISCELLANEOUS CAST-IN-PLACE CONCRETE.

1.3 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Provide signage that is the product of one manufacturer, who has provided signage as specified for a minimum of three (3) years. Submit manufacturer's qualifications.
- B. Installer's Qualifications: Minimum three (3) years' experience in the installation of signage of the type as specified in this Section. Submit installer's qualifications.

1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 00, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.
- B. Sustainable Design Submittals, as described below:
 - 1. Volatile organic compounds per volume as specified in PART 2 - PRODUCTS
- C. Interior Sign Samples: Sign panels and frames, with letters and symbols, for each sign type.
 - 1. Sign Panel, 8 x 10 inches, with letters.

2. Color samples of each color, 6 x 6 inches. Show anticipated range of color and texture.
3. Sample of typeface, arrow and symbols in a typical full size layout.
- D. Exterior Sign Samples: 6 x 6 inches samples of each color and material.
- E. Manufacturer's Literature:
 1. Showing the methods and procedures proposed for the anchorage of the signage system to each surface type.
 2. Manufacturer's printed specifications and maintenance instructions.
- F. Sign Location Plan, showing location, type and total number of signs required.
- G. Shop Drawings: Scaled for manufacture and fabrication of sign types. Identify materials, show joints, welds, anchorage, accessory items, mounting and finishes.
- H. Full size layout patterns for dimensional letters.
- I. Manufacturer's qualifications.
- J. Installer's qualifications.

1.5 DELIVERY AND STORAGE

- A. Deliver materials to job in manufacturer's original sealed containers with brand name marked thereon. Protect materials from damage.
- B. Package to prevent damage or deterioration during shipment, handling, storage and installation. Maintain protective covering in place and in good repair until removal is necessary.
- C. Deliver signs only when the site and mounting services are ready for installation work to proceed.
- D. Store products in dry condition inside enclosed facilities.

1.6 WARRANTY

- A. Construction Warranty: Comply with FAR clause 52.246-21, "Warranty of Construction".

1.7 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced.
The publications are referenced in the text by the basic designation only.

B. American Architectural Manufacturers Association (AAMA):

- 611-14Anodized Architectural Aluminum
- 2603-13Voluntary Specification, Performance Requirements and
Test Procedures for Pigmented Organic Coatings on
Aluminum Extrusions and Panels

C. American National Standards Institute (ANSI):

- A117.1-09.....Accessible and Usable Buildings and Facilities

D. ASTM International (ASTM):

- A36/A36M-14.....Carbon Structural Steel
- A240/A240M-15Chromium and Chromium-Nickel Stainless Steel Plate,
Sheet, and Strip for Pressure Vessels and for General
Applications
- A666-10.....Annealed or Cold-Worked Austenitic Stainless Steel Sheet,
Strip, Plate and Flat Bar
- A1011/A1011M-14Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural,
High-Strength Low-Alloy, High-Strength Low-Alloy with
Improved Formability, and Ultra-High Strength
- B36/B36M-13.....Brass Plate, Sheet, Strip, and Rolled Bar
- B152/B152M-13.....Copper Sheet, Strip, Plate, and Rolled Bar
- B209-14Aluminum and Aluminum-Alloy Sheet and Plate
- B209M-14.....Aluminum and Aluminum-Alloy Sheet and Plate (Metric)
- B221-14Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire,
Shapes, and Tubes
- B221M-13.....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire,
Shapes, and Tubes (Metric)
- C1036-11(R2012)Flat Glass
- C1048-12Heat-Treated Flat Glass-Kind HS, Kind FT Coated and
Uncoated Glass
- C1349-10Architectural Flat Glass Clad Polycarbonate

D1003-13.....Test Method for Haze and Luminous Transmittance of
Transparent Plastics

D4802-10.....Poly(Methyl Methacrylate) Acrylic Plastic Sheet

D. Code of Federal Regulation (CFR):

40 CFR 59Determination of Volatile Matter Content, Water Content,
Density Volume Solids, and Weight Solids of Surface
Coating

E. Federal Specifications (Fed Spec):

MIL-PRF-8184FPlastic Sheet, Acrylic, Modified.

MIL-P-46144C.....Plastic Sheet, Polycarbonate

F. National Fire Protection Association (NFPA):

70-14National Electrical Code

PART 2 - PRODUCTS

2.1 SIGNAGE GENERAL

- A. Provide signs of type, size and design shown on the construction documents.
- B. Provide signs complete with lettering, framing and related components for a complete installation.
- C. Provide graphics items as completed units produced by a single manufacturer, including necessary mounting accessories, fittings and fastenings.
- D. Do not scale construction documents for dimensions. Verify dimensions and coordinate with field conditions. Notify Contracting Officer Representative (COR) of discrepancies or changes needed to satisfy the requirements of the construction documents.

2.2 EXTERIOR SIGNAGE PERFORMANCE REQUIREMENTS

- A. Thermal Movements: For exterior signs, allow for thermal movements from ambient and surface temperature changes 120 degrees F ambient and 180 degrees F material surfaces.

2.3 INTERIOR SIGN MATERIALS

- A. Aluminum:
 - 1. Sheet and Plate: ASTM B209M (B209).

2. Extrusions and Tubing: ASTM B221M (B221).
- B. Cast Acrylic Sheet: MIL-PRF-8184F; Type II, class 1, Water white non-glare optically clear.
Matt finish water white clear acrylic shall not be acceptable.
- C. Standoffs: 1" Diameter, Brushed Aluminum.
- D. Polycarbonate: MIL-P-46144C; Type I, class 1.
- E. Vinyl: Premium grade 00.004 inch thick machine cut, having a pressure sensitive adhesive and integral colors.
- F. Adhesives:
 1. Adhesives for Field Application: Mildew-resistant, non-staining adhesive for use with specific type of panels, sheets, or assemblies; and for substrate application; as recommended in writing by signage manufacturer.
 2. Adhesives to have VOC content of 50 g/L or less when calculated according to 40 CFR 59, (EPA Method 24).
- G. Typography: Comply with VA Signage Design Guide.
 1. Type Style: Helvetica Medium and Helvetica Medium Condensed. Initial caps or all caps, as indicated in Sign Message Schedule.
 2. Arrow: Comply with graphic standards in construction documents.
 3. Letter spacing: Comply with graphic standards in construction documents.
 4. Letter spacing: Comply with graphic standards in construction documents.
 5. Provide text, arrows, and symbols in size, colors, typefaces and letter spacing shown in construction documents. Text shall be a true, clean, accurate reproduction of typeface(s). Text shown in construction documents is for layout purposes only; final text for signs is listed in Sign Message Schedule

2.4 EXTERIOR SIGN MATERIALS

- A. Aluminum Sheet and Plate: ASTM B209M (B209).
- B. Aluminum Extrusions: ASTM B221M (B221).
- C. Brass Sheet (Yellow Brass): ASTM B36/B36M.
- D. Bronze Plate: ASTM B36/B36M.
- E. Copper Sheet: ASTM B152/B152M.

- F. Steel Products: Structural steel products that conform to ASTM A36/A36M. Sheet and strip steel products that conform to ASTM A1011/A1011M.
- G. Stainless Steel Sheet: ASTM A240/A240M, stretcher leveled standard of flatness.
- H. Acrylic Sheet: ASTM D4802; category as standard with manufacturer for each sign.
Provide type UVF.
- I. Fiberglass Sheet: Multiple laminations of glass fiber reinforced polyester resin with UV light stabilized, colorfast, nonfading, weather and stain resistant, colored polyester gel coat with manufacturer's standard finish.
- J. Polycarbonate Sheet: ASTM C1349, Appendix X1, Type II (coated, mar resistant, UV stabilized polycarbonate) with coating on both sides.
- K. Finish:
 - 1. Aluminum Finishes:
 - a. Clear Anodic Finish: AAMA 611.
 - b. Color Anodic Finish: AAMA 611.
 - c. Baked Enamel or Powder Coat Finish: AAMA 2603 with a minimum dry film thickness of,1.5 mils.
 - 2. Metallic Coated Steel Finish:
 - a. Baked Enamel or Powder Coat Finish: After cleaning and pretreating, apply manufacturer's standard two (2) coat baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of 2 mils.

2.5 INTERIOR SIGN TYPES

- A. Conform to the VA Signage Design Guide.
- B. Provide insert and frame component system.
- C. Component System Signs:
 - 1. Provide interior sign system as follows:
 - a. Provide sign system comprised of following primary components:
 - 1) Rail Back: Horizontal rails, spaced to allow for uniform, modular sizing of sign types.

- 2) Rail Insert: Mount to back of Copy Panels to allow for attachment to Rail Back.
 - 3) Copy Panels: Fabricate of acrylic
 - 4) End Caps: Interlock to Rail Back to enclose and secure changeable Copy Panels.
 - 5) Joiners and Accent Joiners: To connect separate Rail Backs together.
 - 6) Top Accent Bars: To provide decorative trim cap that encloses the top of sign.
- b. Provide rail back, rail insert and end caps in anodized extruded aluminum.
 - c. Provide signs in system that are convertible in the field to allow for enlargement from one (1) size to another in height and width through use of joiners or accent joiners, which connect rail back panels together blindly, providing a butt joint between copy panels. Connect accent joiners to rail backs with a visible 1/8" horizontal rib, flush to the adjacent copy insert surfaces.
 - d. Provide sign configurations as indicated on construction documents that vary in width from 9 inches to 80 inches, and have height dimensions of 2 inches, 3 inches, 6 inches, 9 inches and 12 inches. Height that can be increased beyond 12 inches, by repeating height module in full or in part.
2. Provide rail back functions as internal structural member of sign. Fabricate of 6063T5-extruded aluminum, anodized black.
 - a. Fabricate to accept an extruded aluminum or plastic insert on either side, depending upon sign type.
 - b. Provide components that are convertible in field to allow for connection to other rail back panels.
 - c. Provide mounting devices including wall mounting for screw-on applications, wall mounting with pressure sensitive tape, freestanding mount, ceiling mount and other mounting devices as needed.
 3. Provide rail insert functions as mounting device for copy panels on to the rail back.

The rail insert mounts to the back of the copy panel with adhesive suitable for attaching particular copy insert material.

- a. Provide copy panels that slide or snap into the horizontal rail back.
- 4. Provide copy panels that accept various forms of copy and graphics, and attach to the rail back with the rail insert. Provide copy panels fabricated of acrylic.
 - a. Provide copy panels that are interchangeable by sliding horizontally from either side of sign, and to other signs in system of equal or greater width or height.
 - b. Provide materials that are cleanable without use of special chemicals or cleaning solutions.
 - c. Copy Panel Materials.
 - 1) ABS Inserts: .090 inches extruded ABS plastic core with .003 inches acrylic cap bonded during extrusion/texturing process.
 - a) Pressure bonded to extruded rail insert with adhesive.
 - b) Background Color: Integral or painted in acrylic lacquer.
 - c) Finished: Texture pattern.
 - 2) Photopolymer Inserts: .125 inches phenolic photo polymer with raised copy etched to .0937 inches, bonded to an ABS plastic or extruded aluminum insert with adhesive.
 - a) Background Color: Painted, acrylic enamel.
 - 3) Changeable Paper/ Insert Holder: Extruded insert holder with integral rail insert for connection with structural back panel in 6063T5 aluminum with a black anodized finish.
 - a) Inserts into holder are paper with a clear .030 inches textured cover.
 - b) Background Color: Painted, acrylic lacquer.
 - 4) Acrylic .080 inches non-glare acrylic.
 - a) Pressure bonded to extruded rail insert using adhesive.
 - b) Background Color: Painted in acrylic lacquer or acrylic enamel.
 - 5) Extruded 6063T5 aluminum with a black anodized finish insert holder with integral rail insert for connection with structural back panel to hold .030 inches textured polycarbonate insert and a sliding tile which mounts in the inset holder and slides horizontally.

5. End Caps: Extruded using 6063T5 aluminum with a black anodized finish. End caps interlock with rail back with clips to form an integral unit, enclosing and securing the changeable copy panels, without requiring tools for assembly.
 - a. Interchangeable to each end of sign and to other signs in signage system of equal height.
 - b. Provide mechanical fasteners that can be added to the end caps that will secure it to rail back to make sign tamper resistant.
6. Joiners: Extruded using 6063T5 aluminum with a black anodized finish. Rail joiners connect rail backs together blindly, providing a butt joint between copy inserts.
7. Accent Joiners: Extruded using 6063T5 aluminum with a mirror polished finish. Connect joiner and rail backs together with a visible .125 inches horizontal rib, flush to the adjacent copy panel surfaces.
8. Top Accent Rail: Extruded rail using 6063T5 aluminum with a mirror polished finish that provides a .125 inches high decorative trim cap. Cap butts flush to adjacent copy panel and encloses top of rail back and copy panel.
9. Typography:
 - a. Vinyl First Surface Copy (non-tactile): Applied vinyl copy.
 - b. Subsurface Copy Inserts: Textured .030 inches clear polycarbonate face with subsurface applied vinyl copy.
 - 1) Spray face back with paint and laminated to extruded aluminum carrier insert.
 - c. Integral Tactile Copy Inserts: Phenolic photopolymer etched with .0937 inches raised copy.
 - d. Silk-screened First Surface Copy (non-tactile): Injection molded or extruded ABS plastic insert with first surface applied enamel silk-screened copy.
- D. Tactile Sign:
 1. Tactile sign made from a material that provides for letters, numbers and Braille to be integral with sign. Photopolymer etched metal, sandblasted phenolic or embossed material. Do not apply letters, numbers and Braille with adhesive.

2. Numbers, letters and Braille to be raised 1/32 inches from the background surface, unless otherwise noted. The draft of the letters, numbers and Braille to be tapered, vertical and clean.
3. Braille Dots: Conform with ANSI A117.1 for Braille position and layout; (a) Dot base diameter: .059 inches (b) Inter-dot spacing: .090 inches (c) Horizontal separation between cells: .241 inches (d) Vertical separation between cells: .395 inches
4. Paint assembly specified color. After painting, apply white or other specified color to surface of the numbers and letters. Apply protective clear coat sealant to entire sign.
5. Finish: Eggshell, 11 to 19 degree on a 60 degree glossmeter.

E. Seal Panel Sign:

1. Custom Sign: Seal panel signs shall be custom fabricated acrylic panels with wall mounted standoffs and vinyl graphics. Refer to interior elevation 9/A8.0.
 - a. Acrylic panel: 1/2" thick frosted acrylic.
 - b. Stand-Offs: 1" diameter aluminum
 - a. Length: 1", mount wall side flush to face of wood planks
 - c. Graphics: Vinyl Graphics
 - d. Seals: Each sign will have the seal of either the VA or one of the military branches. Each sign will be unique.
 - e. Images: The VA will provide the sign contractor with the electronic image files that are to be applied to each panel.

F. For ceiling mounted signs, provide mounting hardware on the sign that allows for sign disconnection, removal, reinstallation, and reconnection.

G. PACT Area Identification

1. Custom Sign: PACT Area signage shall be custom fabricated acrylic panels with wall mounted standoffs and tactile text. Refer to AW sheets.
 - a. Acrylic Backer Panel: size and thickness as shown on drawings. See Schedule for Finishes for color/finish.
 - b. Acrylic Front Top Panel: size and thickness as shown on drawings. See Schedule for Finishes for color/finish.

- c. Acrylic Front Bottom Panel: size and thickness as shown on drawings. Frosted acrylic material.
- d. Tactile text: thickness and placement as shown on drawings.
- e. Mounted to wall with standoffs

2.6 EXTERIOR SIGN TYPES

A. General:

- 1. Fabricate signs that comply with VA Signage Design Guide.

B. Text and Graphics:

- 1. Non-illuminated Signs: Provide surface applied reflective white opaque vinyl graphics.

C. Non-illuminated Post and Panel Sign:

- 1. Provide non-illuminated sign cabinet mounted to extruded aluminum posts with adjustable reveal between posts and cabinet.
- 2. Construct sign of aluminum extrusion system including the following integral features:
 - a. Water relief channel for proper drainage.
 - b. Internal flanges for attachment of additional structural supports and mounting to posts.
 - c. Extruded aluminum posts.
 - d. Extruded aluminum reveal which is adjustable and frame retainer (maximum 25 mm (1 inch) face dimension) to allow for sign face removal.
- 3. Weld sign cabinet at mitered corners and provide internal bracing to ensure structural rigidity. Shop weld and grind exposed welds smooth so surface is consistent with surrounding surface, and accepts paint finish in like manner.
- 4. Sign Faces: 2.3 mm (0.090 inch) thick aluminum. Mount aluminum faces into the framed extruded cabinet to allow for removal from the top or side, so faces can be changed without affecting extruded sign structure.

D. Non-illuminated Single Post Street Sign:

- 1. Provide sign constructed of extruded aluminum square post.

2. Posts: Extruded aluminum with minimum 0.125 inch wall thickness.

2.7 FABRICATION

- A. Design interior signage components to allow for expansion and contraction for a minimum material temperature range of 100 degrees F, without causing buckling, excessive opening of joints or over stressing of adhesives, welds and fasteners.
- B. Form work to required shapes and sizes, with true curve lines and angles. Provide necessary rebates, lugs and brackets for assembly of units. Provide concealed fasteners wherever possible.
- C. Shop fabricate so far as practicable. Fasten joints flush to conceal reinforcement, or weld joints, where thickness or section permits.
- D. Level and assemble contract surfaces of connected members so joints will be tight and practically unnoticeable, without applying filling compound.
- E. Signs: Fabricate with fine, even texture to be flat and sound.
 1. Maintain lines and miters sharp, arises unbroken, profiles accurate and ornament true to pattern.
 2. Plane surfaces to be smooth, flat and without oil-canning, free of rack and twist.
 3. Maximum variation from plane of surface plus or minus 0.015 inches. Restore texture to filed or cut areas.
- F. Finish extruded members to be free from extrusion marks. Fabricate square turns, sharp corners, and true curves.
- G. Finish hollow signs with matching material on all faces, tops, bottoms and ends. Mitere edge joints to give appearance of solid material.
- H. Do not manufacture signs until final sign message schedule and location review has been completed by the COR and forwarded to contractor.
- I. Drill holes for bolts and screws. Mill smooth exposed ends and edges with corners slightly rounded.
- J. Form joints exposed to weather to exclude water.

- K. Movable Parts, Including Hardware: Cleaned and adjusted to operate as designed without binding or deformation of members. Center doors and covers in opening or frame.
 - 1. Align contact surfaces fit tight and even without forcing or warping components.
- L. Pre-assemble items in shop to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for re-assembly and coordinated installation.
- M. Prime painted surfaces as required. Apply finish coating of paint for complete coverage with no light or thin applications allowing substrate or primer to show.
 - 1. Finish surface smooth, free of scratches, gouges, drips, bubbles, thickness variations, foreign matter and other imperfections.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Locate signs as shown on the construction documents
- B. Conform to the VA Signage Design Guide for installation requirements.
- C. At each sign location there are no utility lines behind each sign location that will be affected by installation of signs.
 - 1. Correct and repair damage done to utilities during installation of signs at no additional cost to Government.
- D. Provide inserts and anchoring devices which must be set in concrete or other material for installation of signs. Submit setting drawings, templates, instructions and directions for installation of anchorage devices, which may involve other trades.
- E. Refer to Signage Message Schedule for mounting method. Mount signs in proper alignment, level and plumb according to the Sign Location Plan and the dimensions given on elevation and Sign Location Plans. When exact position, angle, height or location is not clear, contact COR for resolution.
- F. When signs are installed on glass, provide blank glass back up to be placed on opposite side of glass exactly behind sign being installed. Provide blank glass back that is the same size as sign being installed.

- G. Touch up exposed fasteners and connecting hardware to match color and finish of surrounding surface.
- H. At completion of sign installation, clean exposed sign surfaces. Clean and repair adjoining or adjacent surfaces that became soiled or damaged as a result of installation of signs.

--- END ---

SECTION 10 21 23
CUBICLE CURTAIN TRACKS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies cubicle curtain track (C.C.T.).

1.2 RELATED WORK

- A. Section 05 50 00, METAL FABRICATIONS: Steel shapes for suspending track assembly.
- B. Section 09 51 00, ACOUSTICAL CEILINGS: Acoustical ceiling tile and suspension systems.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Samples:
 - 1. 305 mm (12 inch) long piece of cubicle curtain track with carrier access and end stop.
 - 2. Clip anchor for fastening track to grid system of acoustical ceilings.
 - 3. Curtain carrier for attaching curtain to track.
- C. Shop Drawings: Showing layout of tracks and method of anchorage.
- D. Manufacturer's Literature and Data:
 - 1. Cubicle curtain track.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver material in original package marked to identify the contents, brand name, and the name of the manufacturer or supplier.
- B. Store in dry and protected location. Store so as to not bend or warp the tracks.
- C. Do not open packages until contents are needed for installation, unless verification inspection is required.

1.5 WARRANTY

- A. Construction Warranty: Cubicle curtain tracks are subject to the terms of the Article "Warranty of Construction," FAR clause 52.246-21.

1.6 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced.
The publications are referenced in the text by the basic designation only.
- B. ASTM International (ASTM):
- B221-14.....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire,
Profiles, and Tubes
- B221M-13.....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire,
Profiles, and Tubes (Metric)
- B456-17Electrodeposited Coatings for Copper Plus Nickel Plus
Chromium and Nickel Plus Chromium
- C. Aluminum Association (AA):
- DAF 45-09.....Designation System for Aluminum Finishes
- D. American Architectural Manufacturers Association (AAMA):
- 2603-20Voluntary Specification, Performance Requirements and
Test Procedures for Pigmented Organic Coatings on
Aluminum Extrusions and Panels (with Coil Coating
Appendix)
- E. The National Association of Architectural Metal Manufacturers (NAAMM):
- AMP 500-06 Series.....Metal Finishes Manual

PART 2 - PRODUCTS

2.1 CUBICLE CURTAIN TRACKS

- A. Channel Tracks (Surface Mounted Type): Extruded aluminum, ASTM B221M (B221), alloy 6063, temper T5 or T6, channel shaped, with smooth inside raceway for curtain carriers.
- B. Curtain Carriers: Nylon carriers, with nylon wheels on metal or nylon axles.
1. Equip each carrier with either stainless steel, chromium plated brass or steel hooks with swivel, or nickel chromium plated brass or stainless steel bead chain
 2. Hook for bead chain may be the same material and finish as the bead chain or may be chromium plated steel.

3. Provide 2.2 carriers for every 305 mm (1 foot) of each section of each track length, plus one (1) additional carrier.
- C. End Stop Connectors, Ceiling Flanges and Other Accessories: Fabricate from the same material with the same finish as the tracks or from nylon.
- D. Hangers and Fittings: Fabricate from the same material with the same finish as the tracks. Hangers may be round or square for channel tracks and round for tubular tracks. Design fittings to be compatible with design of tracks and to safely transmit the track load to the hangers.
- E. At end of each section of track, make provision for insertion and removal of carriers. Design to prevent accidental removal of carrier. Provide operating mechanism shall be removable with common tools.

2.2 FASTENERS

- A. Exposed Fasteners, Screws and Bolts: Stainless steel or chromium/nickel plated brass.
- B. Concealed Fasteners, Screws and Bolts: Hot-dip galvanized.
- C. Metal Clips: Anchor curtain tracks to exposed grid of lay-in acoustical tile ceilings, with concealed metal (butterfly) type or two piece snap locking type ceiling clip of high strength spring steel.
 1. When it is not possible to install the metal ceiling clip, the cubicle curtain track may be screwed to the ceiling grid.

2.3 FINISHES

- A. Aluminum: Finish numbers for aluminum specified are in accordance with AA DAF 45. AA-C22A31 finish, chemically etched medium matte with clear anodic coating, Class II Architectural, .01 mm (0.4 mils) thick.
- B. Chrome/Nickel Plating: Satin or polished finish, ASTM B546, minimum thickness of chromium plate as follows:
 1. 0.005 mm (0.2 mil) on copper alloys.
 2. 0.01 mm (0.4 mil) on steel.
- C. Stainless Steel: No. 4 in accordance with NAAMM AMP 500.
- D. Baked Enamel or Powder Coat Finish: AAMA 2603.

2.4 FABRICATION

- A. Weld and grind smooth joints of fabricated components.
- B. Form tracks and bends of lengths that will produce the minimum number of joints.
Make track sections up to 4877 mm (16 feet) without joints. Form corner bend on a 305 mm (12 inch) radius.
- C. Provide steel anchor plates, supports, and anchors for securing components to building construction.
- D. Form flat surface without distortion.
- E. Shop assemble components and package complete with anchors and fittings.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install tracks after finish painting and ceiling finishing operations are complete.
- B. Install track level and hangers plumb and securely anchor to the ceiling or suspend from above to form a rigid installation.
- C. Anchor surface mounted curtain tracks directly to exposed grid of lay-in acoustical tile ceilings with suitable fasteners, spaced approximately 610 mm (24 inches) on center.
- D. Anchor surface mounted curtain tracks to concrete, plaster and gypsum board ceilings with a minimum of 3 mm (1/8-inch) diameter fastenings or concealed clips spaced not more than 914 mm (3 feet) on center.
- E. Install suspended track 2210 mm (87 inches) above the finished floor, with hangers spaced no more than 1219 mm (4 feet) on center. At ceiling line, provide flange fittings secured to hangers with set screws. Secure track to walls with flanged fittings and to hangers with special fittings.
- F. Fasten end stop caps to prevent them from being forced out by the striking weight of carriers.
- G. Remove damaged or defective components and replace with new components or repair to the original condition.
- H. Install track rigid, plumb, level and true, and securely anchored to the overhead construction.

- I. Verify that carrier units operate smoothly and easily over the full range of travel.

--- E N D ---

**SECTION 10 26 00
WALL AND DOOR PROTECTION**

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies wall guards, handrail/wall guard combinations, corner guards and door/door frame protectors .and high impact wall covering

1.2 RELATED WORK

- A. Sustainable Design Requirements: Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS
- B. Structural Steel Corner Guards: Section 05 50 00, METAL FABRICATIONS.
- C. Armor plates and kick plates not specified in this section: Section 08 71 00, DOOR HARDWARE.
- D. Color and texture of aluminum and resilient material: Section 09 06 00, SCHEDULE FOR FINISHES.

1.3 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Manufacturer with a minimum of three (3) years' experience in providing items of type specified.
 - 1. Obtain wall and door protection from single manufacturer.
- B. Installer's Qualifications: Installers are to have a minimum of three (3) years' experience in the installation of units required for this project.

1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Sustainable Design Submittals, as described below:
 - 1. Volatile organic compounds per volume as specified in PART 2 - PRODUCTS.
 - 2. For composite wood products, submit documentation indicating product contains no added urea formaldehyde
- C. Shop Drawings: Show design and installation details.
- D. Manufacturer's Literature and Data:

1. Handrail/Wall Guard Combinations.
 2. Wall Guards.
 3. Corner Guards.
 4. Door/Door Frame Protectors.
- E. Test Report: Showing that resilient material complies with specified fire and safety code requirements.
- F. Manufacturer's qualifications.
- G. Installer's qualifications.
- H. Manufacturer's warranty.

1.5 DELIVERY AND STORAGE

- A. Deliver materials to the site in original sealed packages or containers marked with the name and brand, or trademark of the manufacturer.
- B. Protect from damage from handling and construction operations before, during and after installation.
- C. Store in a dry environment of approximately 21 degrees C (70 degrees F) for at least 48 hours prior to installation.

1.6 WARRANTY

- A. Construction Warranty: Comply with FAR clause 52.246-21 "Warranty of Construction".
- B. Manufacturer Warranty: Manufacturer shall warranty their wall and door protection for a minimum of five (5) years from date of installation and final acceptance by the Government. Submit manufacturer warranty.

1.7 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to extent referenced.
Publications are referenced in text by basic designation only.
- B. ASTM International (ASTM):
A240/A240M-14Chromium and Chromium-Nickel Stainless Steel Plate,
Sheet, and Strip for Pressure Vessels and For General
Applications

- B221-14Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire,
Shapes, and Tubes
- B221M-13.....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire,
Shapes, and Tubes (Metric)
- D256-10.....Impact Resistance of Plastics
- D635-10.....Rate of Burning and/or Extent and Time of Burning of Self-
Supporting Plastics in a Horizontal Position
- E84-14Surface Burning Characteristics of Building Materials
- C. Aluminum Association (AA):
- DAF 45-09.....Designation System for Aluminum Finishes
- D. American Architectural Manufacturers Association (AAMA):
- 611-14Anodized Architectural Aluminum
- E. Code of Federal Regulation (CFR):
- 40 CFR 59Determination of Volatile Matter Content, Water Content,
Density Volume Solids, and Weight Solids of Surface
Coating
- F. The National Association of Architectural Metal Manufacturers (NAAMM):
- AMP 500-06Metal Finishes Manual
- G. National Fire Protection Association (NFPA):
- 80-13Standard for Fire Doors and Windows
- H. SAE International (SAE):
- J 1545-05(R2014)Instrumental Color Difference Measurement for Exterior
Finishes.
- I. Underwriters Laboratories Inc. (UL):
- Annual IssueBuilding Materials Directory

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Stainless Steel: A240/A240M, Type 304.

- B. Aluminum Extruded: ASTM B221M (B221), Alloy 6063, Temper T5 or T6.
- C. Resilient Material:
 - 1. Provide resilient material consisting of high impact resistant extruded acrylic vinyl, polyvinyl chloride, or injection molded thermal plastic conforming to the following:
 - a. Minimum impact resistance of 18 ft.-lbs./sq. inch when tested in accordance with ASTM D256 (Izod impact, ft.-lbs. per inch notched).
 - b. Class 1 fire rating when tested in accordance with ASTM E84, having a maximum flame spread of 25 and a smoke developed rating of 450 or less.
 - c. Rated self-extinguishing when tested in accordance with ASTM D635.
 - d. Provide material labeled and tested by Underwriters Laboratories or other approved independent testing laboratory.
 - e. Provide resilient material for protection on fire rated doors and frames assemblies that is listed by the testing laboratory performing the tests.
 - f. Provide resilient material installed on fire rated wood/steel door and frame assemblies that have been tested on similar type assemblies. Test results of material tested on any other combination of door and frame assembly are not acceptable.
 - g. Provide integral color with colored components matched in accordance with SAE J 1545 to within plus or minus 1.0 on the CIE-LCH scales.

2.2 CORNER GUARDS

- A. Resilient, Shock-Absorbing Corner Guards: Surface mounted type.
 - 1. Snap-on corner guard formed from resilient material, minimum 0.078-inch thick, free floating on a continuous 0.060-inch thick extruded aluminum retainer. Provide appropriate mounting hardware, cushions and base plates as required.
 - 2. Profile: Minimum 3 inch long leg and 1/4 inch corner radius
 - 3. Height: As indicated in 09 06 00 SCHEDULE FOR FINISHES
 - 4. Retainer Clips: Provide manufacturer's standard impact-absorbing clips.
 - 5. Provide factory fabricated end closure caps at top and bottom of surface mounted corner guards.

6. Flush mounted corner guards installed on any fire rated wall to be installed in a manner that maintains the fire rating of the wall. Provide fire test of proposed corner guard system to verify compliance.
 - a. Where insulating materials are an integral part of the corner guard system, provide insulating materials furnished by the manufacturer of the corner guard system.

2.3 HANDRAILS

A. Solid Wood Handrail (HR1)

1. Basis Of Design Product: Subject To Compliance With Requirements, Korowood HW7S Wood Handrail Or Comparable Product By The Following:
 - A. Construction Specialties, Inc.
 - B. Inpro Corporation
2. Handrail: 1-1/2 Inches High By 1-1/2 Inches Deep (140 Mm High By 38 Mm Deep) With 1-1/2 Inch (38 Mm) Diameter Gripping Surface.
 - A. End Caps, Returns, Corners, And Mounting Brackets: Stainless Steel
 - B. Wood Species: Cherry
 - C. Finish: Custom
 - D. Color: As Indicated In Section 09 06 00 Schedule For Finishes
3. Provide handrails and wall guards with prefabricated end closure caps, inside and outside corners, concealed splices, cushions, mounting hardware and other accessories as required. End caps and corners to be field adjustable to assure close alignment with handrails and wall guards. Screw or bolt closure caps to aluminum retainer in a concealed manner.

2.5 RIGID WALL COVERING

- A. Provide wall covering/panels consisting of high impact rigid acrylic vinyl or polyvinyl chloride resilient material.
- B. Rigid Wall Covering (Impact Resistant) (Rwc)
 1. Basis Of Design Product: Subject To Compliance With Requirements, Provide Koroseal Koroguard Sheets Or Comparable Product By The

Following:

- A. Construction Specialties, Inc.
- B. Inpro Corporation
- 2. Size: As Indicated In Section 09 06 00 Schedule For Finishes
- 3. Sheet Thickness: 0.60 Inch (1.5 Mm)
- 4. Trim And Joint Moldings: Extruded Rigid Thermoplastic That Matches
Sheet Wall Covering
- 4. Color And Texture: As Indicated In Section 09 06 00 Schedule For Finishes
- 5. Mounting: Adhesive
- D. Submit statements attesting that the items comply with specified fire and safety code requirements.
- G. Provide adhesive as recommended by the wall covering manufacturer. Provide adhesive with VOC content of 250 g/L or less when calculated according to 40 CFR 59, (EPA Method 24).

2.6 FASTENERS AND ANCHORS

- A. Provide fasteners and anchors as required for each specific type of installation.
- B. Where type, size, spacing or method of fastening is not shown or specified in construction documents, submit shop drawings showing proposed installation details.

2.7 FINISH

- B. Aluminum: In accordance with AA DAF-45.
 - 1. Exposed aluminum: AAMA 611 AA-M12C22A31 chemically etched medium matte, with clear anodic coating, Class II Architectural, 0.4 mil thick. AAMA 611 AA-M12C22A32 chemically etched medium matte with integrally colored anodic coating, Class II Architectural 0.4 mil thick.
 - 2. Concealed aluminum: Mill finish as fabricated, uniform in color and free from surface blemishes.
- C. Stainless Steel: In accordance with NAAMM AMP 500 finish Number 4.
- D. Resilient Material: Embossed textures and color in accordance with SAE J1545.

PART 3 - INSTALLATION

3.1 RESILIENT CORNER GUARDS

- A. Install corner guards on walls in accordance with manufacturer's instructions.

3.6 RIGID WALL COVERING

- A. Surfaces to receive protection to be clean, smooth and free of obstructions.
- B. Install protectors after frames are in place but preceding installation of doors in accordance with approved shop drawings and manufacturer's specific instructions.
- C. Apply with adhesive in controlled environment according to manufacturer's recommendations.
- D. Protection installed on fire rated doors and frames to be installed according to NFPA 80 and installation procedures listed in UL Building Materials Directory; or, equal listing by other approved independent testing laboratory establishing the procedures.
- E. Install Top And Edge Moldings, Corners, And Divider Bars As Required
For A Complete Installation.

--- E N D ---

SECTION 10 28 00
TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 DESCRIPTION

A. SUMMARY:

1. Section Includes: Toilet and bath accessories at dressing rooms, toilets, baths, locker rooms and other areas indicated on drawings.

1.2 RELATED REQUIREMENTS

- A. Color of finishes: Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Ceramic Toilet and Bath Accessories: Section 09 30 13, CERAMIC/PORCELAIN TILING.
- C. Shower Curtain Break Away Pendant Chain Hooks: Section 10 21 23, CUBICLE CURTAIN TRACKS.

1.3 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. American Society of Mechanical Engineers (ASME):
 1. B18.6.4-98(R2005) - Thread Forming and Thread Cutting Tapping Screws and Metallic Drive Screws inch.
- C. American Welding Society (AWS):
 1. D10.4-86(2000) - Welding Austenitic Chromium-Nickle Stainless Steel Piping and Tubing.
- D. ASTM International (ASTM):
 1. A269/A269M-15 - Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
 2. A312/A312M-15b - Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes.
 3. A653/A653M-15 - Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 4. A666-15 - Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

5. A1011/A1011M-14 - Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
6. B30-14a - Copper Alloys in Ingot Form.
7. B75/B75M-11 - Seamless Copper Tube.
8. B221-14 - Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
9. B221M-13 - Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).
10. B456-11e1 - Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.
11. B824-14 - General Requirements for Copper Alloy Castings.
12. C1036-11e1 - Flat Glass.
13. C1048-12e1 - Heat-Strengthened and Fully Tempered Flat Glass.
14. D635-14 - Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.
15. F446-85(2009) - Grab Bars and Accessories Installed in the Bathing Area.
- E. Federal Specifications (Fed. Spec.):
 1. A-A-3002 - Mirror, Glass.
 2. FF-S-107C(2) - Screws, Tapping and Drive.
 3. WW-P-541/8B(1) - Plumbing Fixtures (Accessories, Land Use).
- F. National Architectural Metal Manufacturers(NAAMM):
 1. AMP 500-06 - Metal Finishes Manual.

1.4 SUBMITTALS

- A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Submittal Drawings:
 1. Show size, configuration, and fabrication, anchorage and installation details.
 2. Show mounting locations and heights.

- C. Manufacturer's Literature and Data:
 - 1. Description of each product.
 - 2. Installation instructions.
- D. Samples:
 - 1. Full sized, complete assembly of each product specified.
 - 2. Approved samples may be incorporated into project.
- E. Certificates: Certify each product complies with specifications.
 - 1. Soap dispensers: Certify soap dispensers are fabricated of material that will not be affected by liquid soap, aseptic detergents, and hexachlorophene solutions.
- F. Qualifications: Substantiate qualifications comply with specifications.
 - 1. Manufacturer with project experience list.
- G. Operation and Maintenance Data:
 - 1. Care instructions for each exposed finish product.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 - 1. Regularly manufactures specified products.

1.6 DELIVERY

- A. Deliver products in manufacturer's original sealed packaging.
- B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, color, production run number, and manufacture date.
- C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.7 STORAGE AND HANDLING

- A. Store products indoors in dry, weathertight facility.
- B. Protect products from damage during handling and construction operations.

1.8 WARRANTY

- A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Aluminum: ASTM B221M (ASTM B221), Alloy 6063-T5 and Alloy 6463-T5.
- B. Stainless Steel:
 - 1. Plate Or Sheet: ASTM A666, Type 304, 0.031 inch thick unless otherwise specified.
 - 2. Tubing: ASTM A269/A269M, Grade TP 304, seamless or welded.
 - 3. Pipe: ASTM A312/A312M; Grade TP 304.
- C. Steel Sheet: ASTM A653/A653M, zinc-coated (galvanized) coating designation G90.
- D. Chrome Plating (Service Condition Number SC 2): ASTM B456.
- E. Brass Castings: ASTM B30.
- F. Copper:
 - 1. Tubing: ASTM B75/B75M.
 - 2. Castings: ASTM B824.
- G. Glass:
 - 1. ASTM C1036, Type 1, Class 1, Quality q2, for mirrors, and for mirror doors in medicine cabinets.
 - 2. ASTM C1036, Type 1 Class 1 Quality q3, for shelves in medicine cabinets.
 - 3. ASTM C1048, Kind FT, Condition A, Type 1, Class 1 for glass and mirrors in Mental Health and Behavior Patient Care Units, and Security Examination Rooms.

2.2 PRODUCTS - GENERAL

- A. Basis of Design: Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Provide each product from one manufacturer.

2.3 PAPER TOWEL DISPENSERS

- A. Surface mounted type with sloping top.
- B. Dispensing capacity for 300 sheets of any type of paper toweling.
- C. Fabricate of stainless steel.
- D. Provide door with continuous hinge at bottom, and spring tension cam lock or tumbler lock, keyed alike, at top, and refill sight slot in front.

2.4 COMBINATION PAPER TOWEL DISPENSER AND DISPOSAL UNITS

- A. Recessed.
- B. Dispensing capacity for 400 sheets of any type of paper toweling.
- C. Fabricate of stainless steel.
- D. Form face frames, from one piece.
- E. Provide each door with continuous stainless steel piano hinge and tumbler lock, keyed alike.
- F. Provide removable waste receptacle approximately 40 L (10.5 gal.) capacity, fabricated of 0.02 inch thick stainless steel.

2.5 WASTE RECEPTACLES

- A. Semi-recessed type, without doors. Fed. Spec. WW-P-541, Type II.
- B. Fabricate of stainless steel.
- C. Form face frame from one piece.
- D. Provide removable waste receptacle of approximately 45 L (12 gal.) capacity, fabricated of stainless steel.
- E. Waste receptacle key locked in place.

2.6 TOILET TISSUE DISPENSERS

- A. Double roll surface mounted type.
- B. Mount on continuous backplate.
- C. Removable spindle ABS plastic or chrome plated plastic.
- D. Wood rollers are not acceptable.

2.7 GRAB BARS

- A. Fed. Spec. WW-P-541/8B, Type IV, bars, surface mounted, Class 2, grab bars and complying with ASTM F446.
- B. Fabricate from stainless steel or nylon coated steel, use one type throughout project:
 - 1. Stainless steel: Grab bars, flanges, mounting plates, supports, screws, bolts, and exposed nuts and washers.
 - 2. Nylon Coated Steel: Grab bars and flanges complete with mounting plates and fasteners. Color as specified in Section 09 06 00, SCHEDULE FOR FINISHES.

C. Mounting:

1. Floor Mounted Grab Bars: Exposed type.
2. Swing Up Grab Bars: Exposed type.
3. Metal Toilet Partitions Mounted Grab Bars: Exposed type.
4. Other Types and Locations: Concealed type.

D. Bars:

1. Fabricate to 1-1/2 inch outside diameter.
 - a. Stainless steel, minimum 0.05 inch thick.
 - b. Nylon coated bars, minimum 0.06 inch thick.
2. Fabricate in one continuous piece with ends turned toward walls.
 - a. Swing up grab bars and grab bars continuous around three sides of showers may be fabricated in two sections, with concealed slip joint between.
3. Continuously weld intermediate support to grab bar.
4. Swing Up Bars: Manually operated; designed to prevent bar from falling when in raised position.

E. Flange for Concealed Mounting:

1. Minimum 0.1 inch thick, maximum 3-1/8 inch diameter by 1/2 inch deep, with minimum three set screws for securing flange to back plate.
2. Insert grab bar through center of flange and continuously weld perimeter of grab bar flush to back side of flange.
3. In lieu of providing flange for concealed mounting, and back plate as specified, grab bar may be welded to back plate covered with flange.

F. Flange for Exposed Mounting:

1. Minimum 3/16 inch thick, maximum 3-1/8 inch diameter.
2. Insert grab bar through flange and continuously weld perimeter of grab bar flush to backside of flange.
3. Where mounted on toilet partitions, provide three equally spaced, countersunk holes, sized to accommodate 3/16 inch diameter bolts.

4. Where mounted on floor, provide four equally spaced holes, sized to accommodate 3/8 inch diameter bolts, maximum 3/8 inch from edge of flange.

G. Back Plates:

1. Minimum 0.1046 inch thick metal.
2. Fabricate in one piece, maximum 1/4 inch deep, with diameter sized to fit flange.
Provide slotted holes to accommodate anchor bolts.
3. Provide spreaders, through bolt fasteners, and cap nuts, where grab bars are mounted on partitions.

2.8 CLOTHES HOOKS, ROBE OR COAT

- A. Fabricate hook units from chromium plated brass with satin finish, or stainless steel, using 1/4 inch minimum thick stock, with edges and corners rounded smooth to thickness of metal, or 1/8 inch minimum radius.
- B. Fabricate each unit as a double hook on a single shaft, integral with or permanently fastened to wall flange, provided with concealed fastenings.

2.9 METAL FRAMED MIRRORS

- A. Fed. Spec. A-A-3002 metal frame; stainless steel.
- B. Mirror Glass:
 1. Minimum 1/4 inch thick.
 2. Set mirror in a protective vinyl glazing tape.
- C. Frames:
 1. Channel or angle shaped section with face of frame minimum 3/8 inch wide.
Fabricate with square corners.
 2. Metal Thickness 0.035 inch.
 3. Filler:
 - a. Where mirrors are mounted on walls having ceramic tile wainscots not flush with wall above, provide fillers contoured to conceal void between back of mirror and wall surface.
 - b. Fabricate fillers from same material and finish as mirror frame.
 4. Attached Shelf for Mirrors:

- a. Fabricate shelf of same material and finish as mirror frame.
 - b. Make shelf maximum 6 inches in depth, and extend full width of mirror.
 - c. Close ends and front edge of shelf to same thickness as mirror frame width.
 - d. Form shelf for aluminum framed mirror as integral part of bottom frame member.
 - e. Form stainless steel shelf with concealed brackets to attach to mirror frame.
- D. Back Plate:
1. Fabricate backplate for concealed wall hanging from zinc-coated, or cadmium plated 0.036 inch thick sheet steel, die cut to fit face of mirror frame.
 2. Provide set screw type theft resistant concealed fastening system for mounting mirrors.
- E. Mounting Bracket:
1. Designed to support mirror tight to wall.
 2. Designed to retain mirror with concealed set screw fastenings.

2.10 MEDICINE CABINETS

- A. Fed. Spec. WW-P-541/8B, Type III Medicine cabinets, Style R, Recessed.
1. Mirror Glass: Minimum 3/16 inch thick. Set mirror in protective vinyl glazing tape.
 2. Glass Shelves: Minimum 1/4 inch thick, with bulb-edges at front. Support shelves on adjustable aluminum brackets. Provide three shelves for each cabinet.
 3. Cabinet Body: Fabricate from 0.036 inch thick sheet steel, with baked enamel finish, or 0.036 inch thick stainless steel. Form body in one piece, without seams, and with rounded inside corners.
- B. Hinged Door:
1. Swing door.
 2. Fabricate mirror door approximately 16 by 22 inches.
 3. Cabinet concealed when doors are closed.
 4. Mirror Door Frame: Channel shape, 0.060 inch thick chromium plated brass, or 0.036 inch thick stainless steel.

5. Provide door with full length stainless steel piano hinge, magnetic or friction catches, rubber bumpers, and 90 degree restraining arm with spring type stop.
- C. Sliding Door:
1. Slide door.
 2. Fabricate sliding doors for approximately 26 by 22 inch opening.
 3. Provide nylon glides in stainless steel tracks, door pulls and rubber bumpers.
 4. Entire contents of cabinet concealed when doors closed.

2.11 MOP RACKS

- A. Minimum 40 inches long with five holders.
- B. Clamps:
1. Minimum of 0.05 inch thick stainless steel bracket retaining channel with hard rubber serrated cam; pivot mounted to channel.
 2. Clamps to hold handles from 1/2 inch minimum to 1-1/4 inch maximum diameter.
- C. Support:
1. Minimum 0.04 inch thick stainless steel hat shape channel to hold clamps away from wall as indicated.
 2. Drill wall flange for 1/8 inch fasteners above and below clamp locations.
- D. Secure clamps to support with oval head machine screws or rivets into continuous reinforcing back of clamps.

2.12 STAINLESS STEEL SHELVES (TYPE 44)

- A. Shelves:
1. Fabricate shelves of 0.0478 inch thick sheet to size and design indicated on Drawings.
 2. Fabricate shelves of hollow metal type construction, forming a depressions indicated, with closed fronts, backs, ends and bottoms. Reinforce shelves with 0.05 inch thick sheet steel hat channel stiffeners, full depth, welded to underside of top at bracket locations.
 3. Miter cuts, where made at corners of shelves, continuously welding.
- B. Form brackets of 1/8 inch thick steel as shown. Drill brackets for 1/4 inch anchor bolts.

- C. Weld or Screw brackets to shelves.

2.13 STAINLESS STEEL SHELVES(TYPES 45, 45C)

- A. Fabricate shelves and brackets to design shown of 0.05 inch thick stainless steel.
- B. Round and finish smooth projecting corners of shelves and edge corners of brackets.
Drill brackets for 1/4 inch anchor bolts.
- C. Screw or weld brackets to shelves.

2.14 STAINLESS STEEL SHELVES AT WHEELCHAIR LAVATORY

- A. Side wall mounted:
 - 1. Fabricate to size and shape indicated of 0.05 inch thick sheet.
 - 2. Turn up edges and weld corners closed.
 - 3. Fabricate brackets and weld to shelf. Drill brackets for 1/4 inch anchor bolts.
- B. Back wall mounted:
 - 1. Fabricate to size and shape shown of plate and tube.
 - 2. Turn up edges and weld corners of shelf.
 - 3. Weld tube to back plate and shelf, weld back plate to shelf, filler plate to tube, and corners of shelf with continuous welds.
 - 4. Drill back plate for 1/4 inch anchor bolts.

2.15 FABRICATION - GENERAL

- A. Welding, AWS D10.4.
- B. Grind, dress, and finish welded joints to match finish of adjacent surface.
- C. Form exposed surfaces from one sheet of stock, free of joints.
- D. Provide steel anchors and components required for secure installation.
- E. Form flat surfaces without distortion. Keep exposed surfaces free from scratches and dents. Reinforce doors to prevent warp or twist.
- F. Isolate aluminum from dissimilar metals and from contact with building materials as required to prevent electrolysis and corrosion.
- G. Hot-dip galvanized steel or stainless steel, anchors and fastening devices.
- H. Shop assemble accessories and package with components, anchors, fittings, fasteners and keys.

- I. Key items alike.
- J. Provide templates and rough-in measurements.
- K. Round and deburr edges of sheets to remove sharp edges.

2.16 FINISH

- A. Steel Paint Finish:
 - 1. Powder-Coat Finish: Manufacturer's standard two-coat finish system consisting of the following:
 - a. One coat primer.
 - b. One coat thermosetting topcoat.
 - c. Dry-film Thickness: 0.05 mm (2 mils) minimum.
 - d. Color: Refer to Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Nylon Coated Steel: Nylon coating powder formulated for fluidized bonding process to steel to provide hard smooth, medium gloss finish, minimum 0.3 mm (0.012 inch thick, rated as self-extinguishing when tested according to ASTM D635.
- C. Stainless Steel: NAAMM AMP 500; No. 4 polished finish.
- D. Aluminum Anodized Finish: NAAMM AMP 500.
 - 1. Clear Anodized Finish: AA-C22A41; Class I Architectural, 0.018 mm (0.7 mil) thick.
 - 2. Color Anodized Finish: AA-C22A42 or AA-C22A44; Class I Architectural, 0.018 mm (0.7 mil) thick.
- E. Chromium Plating: ASTM B456, satin or bright as specified, Service Condition No. SC2.

2.17 ACCESSORIES

- A. Fasteners:
 - 1. Fasteners in Mental Health and Behavioral Patient Care Units: Tamper resistant hot-dipped galvanized or stainless steel.
 - 2. Exposed Fasteners: Stainless steel or chromium plated brass, finish to match adjacent surface.
 - 3. Concealed Fasteners:
 - a. Shower, Bath Tubs, and High Moisture Areas: Stainless steel.
 - b. Other Locations: Steel, hot-dipped galvanized.

- 4. Toggle Bolts: For use in hollow masonry or frame construction.
- 5. Sex bolts: For through bolting on thin panels.
- 6. Expansion Shields: Lead or plastic for solid masonry and concrete substrate as recommended by accessory manufacturer to suit application.
- 7. Screws:
 - a. ASME B18.6.4.
 - b. Fed. Spec. FF-S-107, Stainless steel Type A.
- B. Adhesive: As recommended by manufacturer to suit application.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine and verify substrate suitability for product installation.
 - 1. Verify blocking to support accessories is installed and located correctly.
- B. Verify location of accessories with Contracting Officer's Representative.

3.2 INSTALLATION

- A. Install products according to manufacturer's instructions and approved submittal drawings.
 - 1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.
- B. Install grab bars according to ASTM F446.
- C. Set work accurately, in alignment and where indicated, parallel or perpendicular as required to line and plane of surface. Install accessories plumb, level, free of rack and twist.
- D. Toggle bolt to steel anchorage plates in frame partitions and hollow masonry. Expansion bolt to concrete or solid masonry.
- E. Install accessories to function as designed. Perform maintenance service without interference with performance of other devices.

- F. Position and install dispensers, and other devices in countertops, clear of drawers, permitting ample clearance below countertop between devices, and ready access for maintenance.
- G. Align mirrors, dispensers and other accessories even and level, when installed in battery.
- H. Install accessories to prevent striking by other moving, items or interference with accessibility.

3.3 CLEANING

- A. After installation, clean toilet accessories according to manufacturer's instructions.

3.4 PROTECTION

- A. Protect accessories from damage until project completion.

- - E N D - -

SECTION 10 44 13
FIRE EXTINGUISHER CABINETS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section covers recessed fire extinguisher cabinets and fire extinguishers.

1.2 SUBMITTALS

- A. Submit in accordance with Section 013323, SAMPLES AND SHOP DRAWINGS.
- B. Manufacturer's Literature and Data: Fire extinguisher cabinet including installation instruction and rough opening required.

PART 2 - PRODUCTS

2.1 FIRE EXTINGUISHER CABINET

- A. Semi-recessed type with 64mm (2½ inch) radius rolled edge, Cosmopolitan Series 1037V17 by J.L. Industries with Cosmic 10E extinguisher.

2.2 FABRICATION

- A. Form body of cabinet from 0.9 mm (0.0359 inch) thick sheet steel.
- B. Fabricate door and trim number 304 stainless steel all face joints fully welded and ground smooth.
 - 1. Glaze doors with 6 mm (1/4 inch) thick fully tempered float glass complying with ASTM C 1048, Condition A, Type 1, Quality g3, kind FT, Class 1 (clear).
 - 2. Design doors to open 180 degrees.
 - 3. Provide continuous hinge, flush cup pull (ADA compliant), and adjustable roller catch.
 - 4. Identify fire extinguisher in cabinet with FIRE EXTINGUISHER lettering applied to door. Lettering to be vertical, Black.
- C. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. J.L. Industries
 - 2. Larsen's Manufacturing Co.
 - 3. Potter-Roemer, Inc.

4. Or approved equal

2.3 FIRE EXTINGUISHER

- A. General: Provide fire extinguisher in each cabinet shown on drawings.
- B. Multipurpose Dry Chemical Type: UL-rated 4A:60B:C, 10-lb nominal capacity, in enameled steel container.

2.4 FINISH

- A. Finish interior of cabinet body with baked-on semi-gloss white enamel.
- B. Finish door and trim with manufacturers standard number 304 stainless steel, with number 4 satin finish.

PART 3 - EXECUTION

- A. Install fire extinguisher cabinets in prepared openings and secure in accordance with manufacturer's instructions.
- B. Install cabinet so that bottom of cabinet is 991 mm (39 inches) above finished floor.

--- E N D ---

SECTION 11 73 00
CEILING MOUNTED PATIENT LIFT SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION

Ceiling Mounted Patient Lift Systems for the transfer of physically challenged patients are specified in this section.

1.2 RELATED WORK

- A. Section 01 00 00, GENERAL REQUIREMENTS: Requirements for pre-test of equipment.
- B. Section 13 05 41, SEISMIC RESTRAINT REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS: Seismic requirements for non-structural equipment.
- C. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: General Electrical Requirements and items, which are common to sections of Division 26.

1.3 QUALITY ASSURANCE

- A. Certification for compliance is required for Ceiling Mounted Patient Lift Systems. Certifications shall be provided by the manufacturer who will conduct testing to ensure that the ceiling lift and charging system are safe and in compliance with ISO 10535 & UL 60601-1.
- B. Inspection of equipment after installation is required prior to use for patient movement. Inspection shall be in accordance with manufacturer's installation checklist and the facilities installation checklist (Patient Safety Alert AL14-07).
- C. Certification of compliance with VA requirements shall be provided by an independent third party, Inspector of Record (IOR), who will observe installation and manufacturer's testing to ensure that the ceiling structure, ceiling lift, and charging system is safe and compliance with shop drawings, structural calculations, specifications, ISO 10535 requirements, and code requirements. IOR shall be a registered structural engineer in the state of installation.

1.4 SUBMITTALS

- A. Submit in accordance with specification Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

1. Shop drawings shall show structural supports to the underside of structure.
Structural calculations for the support of the track and its attachment to ceiling structure shall be submitted. Shop drawings used in the quoting phase shall be PDFs, and either 2D CAD files or 3D BIM files showing structural support to underside of structure. Shop drawings shall also provide general room layout with bed position and all obstructions to ceiling lift.
2. Once the purchase order is accepted by the vendor, a set of stamped drawings shall be provided by the vendor. Shop drawings and structural calculations shall be signed and stamped by a registered structural engineer, and shall meet all code requirements in the jurisdiction having authority. Structural engineer shall ensure ceiling minimum structure capacity shall support the loads specified in the shop and installation drawings and be in compliance with local structural and seismic codes.
3. Shop drawings shall show obstructions such as curtains, lights and sprinklers, and coordinate their relocation.
4. Manufacturer shall provide BIM (Building Information Model) for clash detection on the request of the Resident Engineer (RE), VA Construction Agent, or General Contractor.

B. Certificates of Compliance from Manufacturer

C. Manufacturer's Literature and Data:

1. Lifting Capacity
2. Lifting Speed
3. Vertical Axis Motor
4. Emergency Brake
5. Emergency Lowering Device
6. Emergency Stopping Device
7. Electronic Soft-Start and Soft-Stop Motor Control
8. Current Limiter for Circuit Protection
9. Strap Length

10. All equipment anchors and supports. Submittals shall include weights, dimensions, center of gravity of the structural support, standard connections, manufacturer's recommendations and behavior problems (e.g., vibration, thermal expansion,) associated with equipment or piping so that the proposed installation can be properly reviewed.
- D. Individual Room layouts showing location of lift system installation shall be approved before proceeding with installation of lifts.
- E. Manufacturer's Checklist for after installation inspection.

1.5 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are listed in the text by the basic designation only.
- B. International Organization for Standardization (ISO):
10535-06Hoist for the Transfer of Disabled Persons-Requirements
and Test Methods
- C. Underwriters Laboratories (UL):
60601-1(2003).....Medical Electrical Equipment: General Requirements for
Safety
94-2013UL Standards for Safety Test for Flammability of Plastic
Materials for Parts in Devices and Appliances-Fifth Edition
- D. International Electromagnetic Commission (IEC):
60601-1-2(2015)Medical electrical equipment – Part 1-2: General
requirements for basic safety and essential performance –
Collateral Standard: Electromagnetic disturbances –
Requirements and tests.
- E. VA Patient Safety Alert AL14-07

PART 2 - PRODUCTS

2.1 CEILING TRACK SYSTEM

- A. The Ceiling Track shall be made from high strength extruded aluminum or VA approved equal. Provide anchor supports at ceiling substrate.

- B. Installed rail shall be security tested for 1.5 times greater than the motor's weight capacity and maximum allowable deflection of a horizontal rail is no more than 1mm (1/16th inch) per 200mm (7.87 inch) of track length. (As per ISO 10535 standards.)

2.2 LIFT UNIT

- A. The Lift Unit shall be constructed of a steel frame system driven by a gear reduced high torque motor or VA approved equal.
- B. The Lift system shall have the following features.
 - 1. Lifting capacity: 550 lbs (249.476 kg) for non-bariatric lifts
 - 2. Electronic soft-start and soft-stop motor control
 - 3. Emergency lowering device
 - 4. Emergency stopping device
 - 5. Current limiter for circuit protection in case of overload.
 - 6. Safety device that stops the motor to lift when batteries are low.
 - 7. Horizontal axis motor
 - 8. Emergency brake (in case of mechanical failure)
 - 9. Strap length:
 - 10. Cab: VO plastic–fire retardant, UL 94

2.3 MOTORS

- A. Vertical Movement-DC Motor

2.4 BATTERIES

- A. The life cycle (number of charging cycles) for batteries shall be in compliance with IEC 6100-1-2.
- B. Provide rechargeable batteries with up to 35 transfers with a load of 200lbs (74kg) (for repositioning) a minimum of 17 transfers with its maximum load.

2.5 CHARGER

- A. Charger

2.6 STRAPS AND SLING

- A. The straps shall meet ISO 10535 guidelines. The straps shall ensure the patient's safety by preventing the patient from falling out of the sling.
- B. The sling shall meet ISO 10535 guidelines. The sling shall cradle the body of the patient.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install ceiling mounted patient lift system as per manufacturer's instruction and under the supervision of manufacturer's qualified representative and as shown on drawings.
- B. If the distance in between the suspended ceiling and anchors is more than 12" consult with manufacturer to determine if lateral braces will be required.

3.2 INSTRUCTION AND PERSONNEL TRAINING

Training shall be provided for the required personnel to educate them on proper operation and maintenance for the lift system equipment.

3.3 TEST

Conduct performance test, in the presence of the Resident Engineer (RE) and/or Inspector of Record (IOR), and a manufacturer's field representative, to show that the patient lift system equipment and control devices operate properly and in accordance with design, specification, and code requirements.

3.4 INSPECTION

- 1. Inspection of installed ceiling mounted patient lift systems shall be conducted in accordance with the manufacturer's installation checklist and the VA installation checklist (Patient Safety Alert AL14-07) prior to use for patient movement.
- 2. Periodic Inspection shall be provided by the manufacturer on a yearly basis in compliance with ISO 10535.

--- E N D ---

SECTION 12 31 00
MANUFACTURED METAL CASEWORK

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies metal casework, VA standard cabinets and related accessories, including lockers in Staff Lounge.

1.2 RELATED WORK

- A. Section 06 20 00, FINISH CARPENTRY: Custom Wood Casework.
- B. Section 07 92 00, JOINT SEALANTS: Sealants.
- C. Section 09 06 00, SCHEDULE OF FINISHES: Color of Casework Finish.
- D. Section 09 22 16, NON-STRUCTURAL METAL FRAMING: Backing Plates for Wall Mounted Casework.
- E. Section 09 65 13, RESILIENT BASE AND ACCESSORIES: Resilient Base.
- F. Section 12 32 00, MANUFACTURED WOOD CASEWORK Standard Manufactured Wood Casework.
- G. Section 12 36 00, COUNTERTOPS: Countertop Construction and Materials and Items Installed in Countertops.
- H. Division 22, PLUMBING: Plumbing Requirements Related to Casework:
- I. Division 26, ELECTRICAL: Electrical Lighting and Power Requirements Related to Casework.

1.3 QUALITY ASSURANCE

- A. Approval by Contracting Officer Representative (COR) is required of manufacturer and installer based upon certification of qualifications specified.
- B. Manufacturer's Qualifications:
 - 1. Manufacturer is regularly engaged in design and manufacture of metal of scope and type similar to requirements of this project for a period of not less than five (5) years.

2. Manufacturer has successfully completed at least three (3) projects of scope and type similar to requirements of this project.
3. Submit manufacturer's qualifications and list of projects.

C. Installer Qualifications:

1. Installer has completed at least three (3) projects in least five (5) years in which these products were installed.
2. Submit installer qualifications.

1.4 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Certificates:

1. Manufacturer's Certificate of qualifications specified.
2. Certificate of installer's qualifications specified.

C. Manufacturer's Literature and Data:

1. Brochures showing name and address of manufacturer, and catalog or model number of each item incorporated into the work.
2. Manufacturer's illustration and detailed description.
3. List of deviations from contract specifications.
4. Locks, each kind.

D. Shop Drawings (1/2 Full Scale):

1. Showing details of casework construction, including kinds of materials and finish, hardware, accessories and relation to finish of adjacent construction, including specially fabricated items or components.
2. Fastenings and method of installation.
3. Location of service connections and access.

E. Samples:

1. Metal plate, 152 mm (6 inch) square, showing chemical resistant finish, in each color.

2. One (1) complete casework assembly, including base and wall cabinet(s) with drawers and doors.

F. Manufacturer's warranty.

1.5 WARRANTY

- A. Construction Warranty: Comply with FAR clause 52.246-21 "Warranty of Construction".
- B. Manufacturer Warranty: Manufacturer shall warranty their wood casework for a minimum of five (5) years from date of installation and final acceptance by the Government. Submit manufacturer warranty.

1.6 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in the text by basic designation only.
- B. American Society for Testing and Materials (ASTM):
 - A36/A36M-19.....Carbon Structural Steel
 - A240/A240M-20Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
 - A283/A283M-18Low and Intermediate Tensile Strength Carbon Steel Plates
 - A568/A568M-19a.....Steel, Sheet, Carbon and High-Strength, Low-Alloy Hot-Rolled and Cold-Rolled, General Requirements
 - A794/A794M-18Standard Specification for Commercial Steel (CS), Sheet, Carbon (0.16% Maximum to 0.25% Maximum) Cold Rolled
 - B456-17Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium
 - C1036-16.....Flat Glass
 - C1048-18.....Heat-Strengthened and Fully Tempered Flat Glass
 - C1172-19Laminated Architectural Flat Glass
- C. American National Standard Institute:
 - Z97.1-2015Safety Glazing Material used In Buildings

D. Builders Hardware Manufacturers Association (BHMA):

- A156.1-16.....Butts and Hinges
- A156.5-20.....Auxiliary Locks and Associated Products
- A156.9-15.....Cabinet Hardware
- A156.11-19.....Cabinet Locks
- A156.16-18.....Auxiliary Hardware

E. American Welding Society (AWS):

- D1.1/D1.1M-20Structural Welding Code Steel
- D1.3/D1.3M-18Structural Welding Code Sheet Steel

F. National Association of Architectural Metal Manufacturers (NAAMM):

- AMP 500 SeriesMetal Finishes Manual

G. U.S. Department of Commerce, Product Standard (PS):

- PS 1-09Construction and Industrial Plywood

H. Underwriters Laboratories Inc. (UL):

- 325-17Door, Drapery, Gate, Louver, and Window Operators and
Systems
- 437-13Key Locks

I. Federal Specifications (Fed. Spec.):

- A-A-55615Shield, Expansion; Nail Expansion (Wood Screw and Lag
Bolt Self-Threading Anchors)

J. Scientific Equipment and Furniture Association (SEFA):

- 2.3-10Installation of Scientific Laboratory Furniture and
Equipment

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Steel: Prime, high grade Class 1 mild annealed, cold-rolled steel free from surface imperfections. A.S.T.M.-A1008. Bolts to be zinc plated or subjected to other rust-retardant treatment.

B. Fasteners:

1. Exposed to View: Chrome plated steel or stainless steel, or finished to match adjacent surface.
2. Provide round head or countersunk fasteners where exposed in cabinets.
3. Expansion Bolts: Fed Spec. A-A-55615. Do not provide lead or plastic shields.
4. Nuts: Fed Spec FF-N-836. Type III, Style 15 where exposed.
5. Sex Bolts: Capable of supporting twice the load.

2.2 MANUFACTURED PRODUCTS

- A. When two (2) or more units are required, use products of one (1) manufacturer.
- B. Manufacturer of casework assemblies is to assume complete responsibility for the final assembled unit.
- C. Provide products of a single manufacturer for parts which are alike.
- D. Basis of Design: **Lyon Standard Locker** OR APPROVED ALTERNATE

2.3 CASEWORK FABRICATION

A. General:

1. Welding: Comply with AWS Standards D1.1/D1.1M and D1.3/D1.3M.
2. Reinforce with angles, channels, and gussets to support intended loads, notch tightly, fit and weld joints.
3. Constructed of sheet steel, except where reinforcing required.

B. Minimum Steel Thickness:

Thickness	Steel Description
0.89 mm (0.035 inch) (20 gage)	Drawer fronts, backs, bodies, closure plates or scribe and filler strips less than 75 mm (3 inches) wide, sloping top, shelf reinforcement channel and shelves. Toe space or casework soffits and ceilings under sloping tops.

Thickness	Steel Description
1.20 mm (0.047 inch) (18 gage)	Base pedestals, casework top sides, back, and bottom panels, closure scribe and filler strips 75 mm (3 inches) or more. Reinforcement for drawers with locks. Tables legs, spreaders and stretchers, when fabricated of cold rolled tubing. Metal for desks; except legs and aprons. Door exterior and interior panels, flush or glazed. Cross rails of base units. Front bottom rails, back bottom rails; rails may be 1.49 mm (0.059 inch) (16 gage) thick. Uprights or posts. Top corner gussets.
1.49 mm (0.059 inch) (16 gage)	Aprons, apron division, reinforcing gussets, table legs, desk legs and aprons, spreaders and stretchers when formed without welding. Toe base gussets, drawer slides, and other metal work. Front top rails and back rails except top back rails may be 1.2 mm (0.047 inch) (18 gage) thick.
1.88 mm (0.074 inch) (14 gage)	Drawer runners door tracks.
2.64 mm (0.104 inch) (12 gage)	Base unit bottom corner gussets and leg sockets.
3 mm (0.12 inch) (11 gage)	Reinforcement for hinge reinforcement inside doors and cabinets.

C. Casework Construction:

1. Welded assembly.
2. Fabricate with enclosed uprights or posts full height or width at front. Include sides, backs, bottoms, soffits, ceilings under sloping tops, headers and rail, assembled to form an integral unit.
3. Make bottom of walls units flush, double panel construction.
4. Make top and cross rails of "U" shaped channel.
5. Provide enclosed backs and bottoms in cabinets, including drawer units.
6. Provide finish panel on exposed cabinet backs.
7. Do not install screws and bolts in construction or assembly of casework, except to secure hardware, applied door stops, accessories, removable panels, and where casework is required to be fastened, end to end or back to back.

8. Close flush exposed soffits of wall hung shelving, knee spaces in counters, and toe spaces at bases.
9. Provide reinforcing for hardware.
10. Size Dimensions:
 - a. Use dimensions shown on construction documents or within tolerances specified.
 - 1) Full height cabinets shown on construction documents are to be the same height back to back.
 - 2) Manufacturer's Tolerance for the same Length, Depth or Height of Cabinet: Not to exceed 1.58 mm (0.0625 inches).

D. Doors:

1. One-piece, 16-gauge steel on single, double and triple tier with both vertical edges formed into channel-shaped formation; top and bottom shall be flanged at 90-degree angle. On multiple tier lockers, hinge side shall be formed into channel shaped formation with other three sides flanged at 90-degree angle.

E. Shelves:

1. Single tier lockers shall have one 24-gauge shelf approximately 9" below top. Flanged on all four sides for strength with the front flange turned 45 degrees for safety and attached at no less than two points through each side flange. Only single tier lockers have shelves.

F. Frames:

1. 16-gauge formed steel channels. Vertical members shall have an additional flange to form continuous door strike. Corners shall be lapped and welded into a rigid assembly. In addition, bottom cross members shall have tang at each end that fits through slot in rear flange of upright frame member to prevent twisting out of alignment. Top and bottom cross members shall provide support for front edge of locker top and locker bottom.

G. Louvers :

1. Louvers shall be provided as follows:

Locker Styles	Louvers
Single/Double tier lockers – 9"w	Six 3-1/2" louvers top and bottom.
Single tier lockers – Over 9"w	Six 6" louvers top and bottom.
Double tier lockers – Over 9"w	Six 6" louvers top and bottom.
Triple tier lockers – 9"w	Two 3-1/2" louvers top and bottom.
Triple tier lockers – Over 9"w	Two 6" louvers top and bottom.
Multiple tier lockers	Three 3-1/2" louvers per door for 12" and 15" wide lockers. Four 6" louvers per door for lockers 18" wide and over.

2.4 ACCESSORIES

A. Coat Hooks:

1. Single tier, double tier and triple tier lockers shall have one double prong hook and three single prong wall hooks. 5/8" diameter coat rods are standard in 18" and 21" deep knocked down single tier lockers, replacing ceiling hook. All hooks to be zinc plated or subjected to a comparable rust retardant treatment and attached with two bolts.

2.5 HARDWARE

A. Factory installed.

B. Exposed hardware, except as specified otherwise, satin finished chromium plated brass or nickel plated brass or anodized aluminum.

C. Cabinet Locks:

1. Where locks are shown on construction documents.
2. Quiet Locking Device - Single tier locking device shall engage frame at three points; double tier and triple tier at two points. Channel shaped locking device with full length reinforcing ribs shall be a quiet design utilizing nylon guide inserts to reduce metal-to-metal contact. The locking device shall include a latch finger that engages the 12-gauge door jamb. Lock bar shall be enclosed on three sides and operate

within the channel formation of the door. Locking device shall be prelocking so mechanism can be locked in open position – door locking automatically when closed. Box lockers shall have one-point locking device with a 14-gauge lock clip for attaching padlock. Doors also to be provided with lock hole filler to permit use of built-in lock.

3. Marking of Locks and Keys:

- a. Name of manufacturer, or trademark which can readily be identified legibly marked on each lock and key change number marked on exposed face of lock.
- b. Key change numbers stamped on keys.
- c. Key change numbers to provide sufficient information for manufacturer to replace key.

D. Cabinet Hardware: ANSI BHMA A156.9.

1. Door/Drawer Pulls: B02011.

- a. One (1) for drawers up to 584 mm (23 inches) wide.
- b. Two (2) for drawers over 584 mm (23 inches) wide.
- c. Sliding door flush pull, each door: B02201.
- d. Provide drawer and door pulls of a design that can be operated with a force of 22.2 N (5 pounds) or less, with one (1) hand and not require tight grasping, pinching or twisting of the wrist.

2. Door in seismic zones: B03352.

- a. Do not provide thumb latch on doors equipped with three (3) point locking device.
- b. Provide lever operated two (2) point latching device on paired doors over 915 mm (36 inches) high if three (3) point locking or latching device is not used.

3. Cabinet Door Catch:

- a. Install at bottom of wall cabinets, top of base cabinets and top and bottom of full height cabinet doors over 1220 mm (48 inches).
- b. Omit on doors with locks.

4. Door Jambs:

- a. 48" and higher single tier lockers shall have three door jambs; double tier and triple tier lockers shall have two jambs welded to side of door frames to engage locking device. Design and gauge of jamb shall prevent freeing of locking device by prying. Each jamb shall have easily replaceable soft rubber bumper.
5. Hinges:
 - a. Shall not be less than 2" high, .050" steel, 5 knuckle, and full loop design forming double thickness on each leaf. Hinges to be set in slot in door and frame and projection welded to frame and securely attached to door; Hinge pin to be spun over at ends to resist removal. Single-tier lockers 48", 60" and 72" high to have three hinges. All other tiers to have two hinges – all on right hand side of door.
6. Pivot hinges: ANSI/BHMA A156.1 A875B.
7. Shelf Supports:
 - a. Install in casework where adjustable shelves are noted on construction documents.
 - b. Adjustable Shelf Standards: B04061 with shelf rest B04081.
 - c. Vertical Slotted Shelf Standard: B04102 with shelf brackets B04112 sized for shelf depth.
8. Auxiliary Hardware: ANSI A156.16.
9. Door silencers: LO3011 or LO3031.
 - a. Install two (2) rubber bumpers each door.
 - b. Silencers set near top and bottom of jamb.
10. Handles:
 - a. On single, double and triple tier lockers, handles shall be recessed. No moving parts are to operate against outside surface of locker. Padlock attachment to be integral part of lift, which shall be attached directly to locking bar and protected by fixed handle housing. Handle to provide built in padlock strike. The recessed handle shall be 4-1⁷/₈"w x 6-1¹/₂"h x 1-1¹/₄"d. Multiple tier lockers shall be equipped with a 16-gauge door pull with padlock attachment when not used with built in locks.

2.6 METAL FINISHES

- A. Comply with NAAMM AMP 500 series and as specified.
- B. Standard Finish: Exposed steel parts shall be thoroughly cleaned, given a bonding and rust inhibitive phosphate treatment and then electrostatically sprayed with powder coat.
- C. Steel Cabinets including Closures and Filler Strips:
 - 1. Acid resisting finish except hardware and stainless steel.
 - 2. After fabrication of cabinet submerge in a degreasing bath, and thoroughly rinse to remove dirt and grease, and other foreign matter.
 - 3. Apply non-metallic phosphate coating, then finish with baked-on acid resisting enamel not less than 1 mil (0.001 inch) thick.
 - 4. Finish resistant to action of the following reagents when 0.5 cm³ (10 drops) are applied to the surface and left open to the atmosphere for period of one (1) hour.

REAGENTS	
Hydrochloric Acid 37 percent	Ethyl Alcohol
Phosphoric Acid 75 percent	Methylethyl Keytone
Sulfuric Acid 25 percent	Acetone
Glacial Acetic Acid	Ethyl Acetate
Sodium Hydroxide 10 percent	Ethyl Ether
Sodium Hydroxide (concentrated)	Carbon Tetrachloride
Hydrogen Peroxide 5 percent	Xylene
Formaldehyde 37 percent	Phenol 85 Percent

- 5. Color of finish is specified in Section 09 06 00, SCHEDULE FOR FINISHES.

D. Brass:

- 1. U.S. Standard Finish No. 26 for hardware items.
- 2. Other brass items: ASTM B456, chromium plated finish meeting requirements for Service Condition SCI.

- E. Aluminum: Chemically etched medium matte, clear anodic coating, Class II, Architectural, 0.4 mils (0.0004 inches) thick.
- F. Stainless Steel: Mechanical finish No. 4 on sheet except No. 7 on tubing.

2.7 VA STANDARD CABINETS:

- A. Laboratory and Hospital Casework, including metal casework of the following types:
 - 1. Wardrobe Cabinet, Metal, 5A (VA Standard Detail SD123100-02).
 - 2. Wall Cabinet, Metal, 5B (VA Standard Detail SD123100-01).

2.8 PRODUCTS OF OTHER COMPONENTS DIRECTLY RELATED TO CASEWORK

- A. Refer to Section 07 92 00, JOINT SEALANTS for work related to sealants used in conjunction with joints of countertops, casework systems, and adjacent materials.
- B. Refer to Section 09 65 13, RESILIENT BASE AND ACCESSORIES for work related to rubber base adhered to casework systems.
- C. Refer to Section 09 22 16, NON-STRUCTURAL METAL FRAMING for backing plates used in conjunction with wall assemblies for the attachment of casework systems.
- D. Refer to Section 12 36 11, COUNTERTOPS for work related to plastic laminate, acid-resistant plastic laminate, metal, molded resin, wood, and methyl methacrylic polymer countertops and/or shelving used in conjunction with casework systems. When countertop materials are provided by the casework manufacturer, they are to include the following features:
 - 1. Capable of being suspended from vertical support rails or horizontal wall strips or service modules.
 - 2. Provided with rounded corners and impact resistant material on exposed edges.
 - 3. Capable of being easily relocated and installed without tools.
 - 4. Capable of being suspended and easily changed under counter mounted storage units.
 - 5. Provide leveling adjustment capability so units can be brought into a level position.
 - 6. Secured using fasteners. Show detail on shop drawings.

- E. Refer to Section 12 36 11, COUNTERTOPS for work related to and integral with countertop systems such as pegboards, funnel and graduate racks.
- F. Refer to Division 22, PLUMBING for the following work related to casework systems:
 - 1. Sinks, faucets and other plumbing service fixtures, venting, and piping systems.
 - 2. Compressed air, gas, vacuum and piping systems.
- G. Refer to Division 26, ELECTRICAL for the following work related to casework systems:
 - 1. Connections and wiring devices.
 - 2. Connections and lighting fixtures except when factory installed by the manufacturer.

PART 3 - EXECUTION

3.1 COORDINATION

- A. Begin only after work of other trades is complete, including wall and floor finish completed, ceilings installed, light fixtures and diffusers installed and connected, and area free of trash and debris.
- B. Verify location and size of mechanical and electrical services as required and perform cutting of components of work installed by other trades.
- C. Verify reinforcement of walls and partitions for support and anchorage of casework.
- D. Coordinate with other Divisions and Sections of the specification for work related to installation of casework systems to avoid interference and completion of service connections.

3.2 INSTALLATION

- A. Install casework in accordance with manufacturer's written instructions and per SEFA 2.3 recommendations.
 - 1. Install in available space; arranged for safe and convenient operation and maintenance.
 - 2. Align cabinets for flush joints except where shown otherwise on construction documents.

3. Install with bottom of wall cabinets in alignment and tops of base cabinets aligned level, plumb, true, and straight to a tolerance of 3.2 mm in 2438 mm (1/8 inch in 96 inches).
4. Install corner cabinets with hinges on corner side with filler or spacers sufficient to allow opening of drawers.

B. Support Rails:

1. Install true to horizontal at heights shown on construction documents; maximum tolerance for uneven floors is plus or minus 13 mm (1/2 inch).
2. Shim as necessary to accommodate variations in wall surface not exceeding 5 mm (3/16 inch) at fastener.

- C. Seal junctures of casework systems with mildew-resistant silicone sealants as specified in Section 07 92 00, JOINT SEALANTS.**

3.3 CLOSURES AND FILLER PLATES

- A. Close openings larger than 6 mm (1/4 inch) wide between cabinets and adjacent walls with flat, steel closure strips, scribed to required contours, or machined formed steel fillers with returns, and secured with sheet metal screws to tubular or channel members of units, or bolts where exposed on inside.
- B. Where ceilings interfere with installation of sloping tops, omit sloping tops and provide flat steel filler plates.
- C. Secure filler plates to casework top members, unless shown otherwise on construction documents.
- D. Secure filler plates more than 152 mm (6 inches) in width top edge to a continuous 25 x 25 mm (1 x 1 inch) 0.889 mm (1/16 inch) thick steel formed steel angle with screws.
- E. Anchor angle to ceiling with toggle bolts.
- F. Install closure strips at exposed ends of pipe space and offset opening into concealed space.
- G. Finish closure strips and fillers with same finishes as cabinets.

3.4 FASTENINGS AND ANCHORAGE

- A. Do not anchor to wood ground strips.
- B. Provide hat shape metal spacers where fasteners span gaps or spaces.
- C. Use 6 mm (1/4 inch) diameter toggle or expansion bolts, or other appropriate size and type fastening device for securing casework to walls or floor. Use expansion bolts shields having holding power beyond tensile and shear strength of bolt and breaking strength of bolt head.
- D. Use 6 mm (1/4 inch) diameter hex bolts for securing cabinets together.
- E. Use 6 mm (1/4 inch) by minimum 38 mm (1-1/2 inch) length lag bolt anchorage to wood blocking for concealed fasteners.
- F. Use not less than No. 12 or 14 wood screws with not less than 38 mm (1 1/2 inch) penetration into wood blocking.
- G. Space fastening devices 305 mm (12 inches) on center with minimum of three (3) fasteners in 915 or 1219 mm (3 or 4 foot) unit width.
- H. Anchor floor mounted cabinets with a minimum of four (4) bolts through corner gussets. Anchor bolts may be combined with or separate from leveling device.
- I. Secure cabinets in alignment with hex bolts or other internal fastener devices removable from interior of cabinets without special tools. Do not use fastener devices which require removal of tops for access.
- J. Where units abut end to end, anchor together at top and bottom of sides at front and back. Where units are back to back, anchor backs together at corners with hex bolts placed inconspicuously inside casework.
- K. Where type, size, or spacing of fastenings is not shown or specified on construction documents, show on shop drawings proposed fastenings and method of installation.

3.5 ADJUSTMENTS

- A. Adjust equipment to insure proper alignment and operation.
- B. Replace or repair damaged or improperly operating materials, components or equipment.

3.6 CLEANING

- A. Immediately following installation, clean each item, removing finger marks, soil and foreign matter resulting from work of this section.
- B. Remove from job site trash, debris and packing materials resulting from work of this section.
- C. Leave installed areas clean of dust and debris resulting from work of this section.

3.7 INSTRUCTIONS

- A. Provide operational and cleaning manuals and verbal instructions in accordance with Article INSTRUCTIONS, SECTION 01 00 00, GENERAL REQUIREMENTS.
- B. Provide in service training both prior to and after facility opening. Coordinate in service activities with COR.
- C. Commencing at least seven (7) days prior to opening of facility, provide one (1) 4-hour day of on-site orientation and technical instruction on use and cleaning procedures application of products and systems specified herein.

--- E N D ---

SECTION 12 32 00
MANUFACTURED WOOD CASEWORK

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. This section specifies plastic laminate casework as detailed on the construction documents, including related components and accessories required to form integral units. Wood casework items shown on the construction documents, but not specified below are to be included as part of the work under this section, and applicable portions of the specification are to apply to these items.

1.2 RELATED WORK:

- A. Custom Wood Casework: Section 06 20 00, FINISH CARPENTRY.
- B. Sealants: Section 07 92 00, JOINT SEALANTS.
- C. Color of Casework Finish: Section 09 06 00, SCHEDULE OF FINISHES.
- D. Resilient Base: Section 09 65 13, RESILIENT BASE AND ACCESSORIES.
- E. Backing Plates for Wall Mounted Casework: Section 09 22 16, NON-STRUCTURAL METAL FRAMING.
- F. Standard Manufactured Metal Casework: Section 12 31 00, MANUFACTURED METAL CASEWORK.
- H. Countertop Construction and Materials and Items Installed in Countertops: Section 12 36 00, COUNTERTOPS.
- I. Plumbing Requirements Related to Casework: Division 22, PLUMBING.
- J. Electrical Lighting and Power Requirements Related to Casework: Division 26, ELECTRICAL.

1.3 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data:
 - 1. Locks for doors and drawers.
 - 2. Adhesive cements.
 - 3. Casework hardware.

C. Samples:

1. Wood Face Veneer or Hardwood Plywood.
2. Plastic laminate.

D. Shop Drawings (1/2 full size):

1. Each casework type, showing details of construction, including materials, hardware and accessories.
2. Fastenings and method of installation.

E. Certification:

1. Manufacturer's qualifications specified.
2. Installer's qualifications specified.

1.4 QUALITY ASSURANCE:

A. Approval by COR is required of manufacturer and installer based upon certification of qualifications specified.

B. Manufacturer's qualifications:

1. Manufacturer is regularly engaged in design and manufacture of modular plastic laminate casework, casework components and accessories of scope and type similar to indicated requirements for a period of not less than five (5) years.
2. Manufacturer has successfully completed at least three (3) projects of scope and type similar to indicated requirements.
3. Submit manufacturer's qualifications and list of projects, including owner contact information.

C. Installer Qualifications:

1. Installer has completed at least three (3) projects in last five (5) years in which these products were installed.
2. Submit installer qualifications.

1.5 WARRANTY:

A. Construction Warranty: Comply with FAR clause 52.246-21 "Warranty of Construction".

- B. Manufacturer Warranty: Manufacturer shall warranty their wood casework for a minimum of five (5) years from date of installation and final acceptance by the Government. Submit manufacturer warranty.

1.6 APPLICABLE PUBLICATIONS:

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by basic designation only.
- B. ASTM International (ASTM):
- A240/A240M-14Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
- A1008/A1008M-13Steel, Sheet, Cold-Rolled, Carbon, Structural, High Strength Low Alloy
- C1036-11E1(R2012)Flat Glass
- C. Builders Hardware Manufacturers Association (BHMA):
- A156.1-13.....Butts and Hinges
- A156.9-10.....Cabinet Hardware
- A156.5-14.....Auxiliary Locks and Associated Products
- A156.11-14.....Cabinet Locks
- D. Composite Panel Association (CPA):
- A208.1-09.....Particleboard
- A208.2-09.....Medium Density Fiberboard (MDF) for Interior Applications
- E. U.S. Department of Commerce Product Standards (Prod. Std):
- PS 1-09Construction and Industrial Plywood
- F. Hardwood, Plywood and Veneer Association (HPVA):
- HP-1-09Hardwood and Decorative Plywood
- G. Architectural Woodwork Institute (AWI):
- Architectural Woodwork Standards, Edition 2 Certification Program - 2014

H. American Society of Mechanical Engineers (ASME):

A112.18.1-12.....Plumbing Fixture Fittings

I. National Electrical Manufacturers Association (NEMA):

LD 3-05High Pressure Decorative Laminates

J. Underwriters Laboratories Inc. (UL):

437-08(R2013)Key Locks

K. Scientific Equipment and Furniture Association (SEFA):

2.3-10Installation of Scientific Laboratory Furniture and
Equipment

PART 2 - PRODUCTS

2.2 PLASTIC LAMINATE:

- A. NEMA LD 3.
- B. Exposed decorative surfaces, both sides of cabinet doors, and for items having plastic laminate finish. General purpose Type HGL.
- C. Cabinet Interiors Including Shelving: Both of following options to comply with NEMA LD 3 as a minimum.
 - 1. Plastic laminate clad plywood or particleboard, MDF (excluding shelves).
- D. Backing sheet on bottom of plastic laminate covered wood tops. Backer Type BKL.
- E. Post Forming Fabrication, Decorative Surface: Post forming Type HGP.

2.3 PLYWOOD, SOFTWOOD:

- A. Prod. Std. PS1, five (5) ply construction from 1/2 inch to 1-1/8 inch thickness, and seven (7) ply for 1 1/4 inch thickness.

2.4 PARTICLEBOARD:

- A. CPA A208.1, Type 1, Grade M or medium density.

2.5 MEDIUM DENSITY FIBERBOARD (MDF):

- A. Fully waterproof bond conforming to CPA A208.1 and CPA A208.2.

2.6 GLASS:

- A. ASTM C1048 Kind FT Type I, Class 1, Quality q3.
- B. For Doors: 1/4 inch thick; except where laminated glass is shown on construction documents.

C. For Shelves: 1/4 inch thick.

D. Laminated Glass: Fabricate of two (2) sheets of 1/8 inch thick clear ASTM C1172 Kind LT glass, laminated together with a 0.060 inch thick vinyl interlayer, to a total overall thickness of 5/16 inch.

2.7 HARDWARE:

A. Cabinet Locks:

1. Provide where locks are indicated on construction documents.
2. Locked pair of hinged door over 36 inches high:
 - a. ANSI/BHMA A156.5, key one side.
 - b. On active leaf use three (3) point locking device, consisting of two (2) steel rods and lever controlled cam at lock, to operate by lever having lock cylinder housed therein.
 - c. On inactive leaf provide dummy lever of same design.
 - d. Provide keeper holes for locking device rods and cam.
3. Door and Drawer: ANSI/BHMA A156.11 cam locks. Provide one (1) type for each condition as follows:
 - a. Drawer and Hinged Door up to 36 inches high: E07261.
 - b. Drawer and Hinged Door: Pin-tumbler, cylinder type lock with not less than four (4) pins or a UL 437 rated wafer lock with brass working parts and case.
 - c. Sliding Door: E07161.
4. Key locks differently for each type casework and master key for each service, such as Nursing Units, Pharmacy.
 - a. Key drug locker inner door different from outer door.
 - b. Furnish two (2) keys per lock.
 - c. Furnish six (6) master keys per service or Nursing Unit.
5. Marking of Locks and Keys:
 - a. Name of manufacturer, or trademark which can readily be identified legibly marked on each lock and key change number marked on exposed face of lock.
 - b. Key change numbers stamped on keys.

- c. Key change numbers to provide sufficient information for manufacturer to replace key.
- B. Hinged Doors:
 - 1. Provide doors 36 inches and more in height with three (3) hinges and doors less than 36 inches in height is to have two (2) hinges. Each door is to close against two (2) rubber bumpers.
 - 2. Hinges: Fabricate hinges with minimum 0.072 inch thick chromium plated steel leaves, and with minimum 0.139 inch diameter stainless steel pin. Hinges to be five (5) knuckle design with 2-1/2 inch high leaves and hospital type tips.
 - 4. Fasteners: Provide full thread wood screws to fasten hinge leaves to door and cabinet frame. Finish screws to match finish of hinges.
- C. Door Catches:
 - 1. Friction or Magnetic type, fabricated with metal housing.
 - 2. Provide one (1) catch for cabinet doors 48 inches high and under, and two (2) for doors over 48 inches high.
- D. Drawer and Door Pulls:
 - 1. Doors and drawers to have flush pulls, fabricated of either chromium-plated brass, chromium plated steel, stainless steel, or anodized aluminum. Drawer and door pulls to be of a design that can be operated with a force of 22.2 N (5 pounds) or less, with one (1) hand and not require tight grasping, pinching or twisting of the wrist.
- E. Drawer Slides:
 - 1. Full extension steel slides with nylon ball-bearing rollers.
 - 2. Slides to have positive stop.
 - 3. Equip drawers with rubber bumpers.
- F. Sliding Doors:
 - 1. Each door to be supported by two ball bearing bronze or nylon rollers, or sheaves riding on a stainless steel track at top or bottom, and to be restrained by a nylon or stainless steel guide at the opposite end.
 - 2. Plastic guides are not acceptable.

3. Each door to have rubber silencers set near top and bottom of each jamb.

G. Shelf Standards (Except For Fixed Shelves):

1. Bright zinc-plated steel for recessed mounting with screws, 5/8 inch wide by 3/16 inch high providing 1/2 inch adjustment, complete with shelf supports.

H. Gate Bolt:

1. Surface mounted barrel type with strike.

I. Hinged Gates:

1. Gates to have two (2) double-acting hinges size as required for gate size and weight.

J. Castors:

1. Locking type rated for 79 kg (175 lbs.) each.

K. Floor Glides:

1. Non-skid material minimum 1 inch diameter with minimum 5/8 inch height adjustment.

2.8 MANUFACTURED PRODUCTS:

- A. When two (2) or more units are required, use products of one (1) manufacturer.
- B. Manufacturer of casework assemblies is to assume complete responsibility for the final assembled unit.
- C. Provide products of a single manufacturer for parts which are alike.

2.9 FABRICATION:

- A. Casework to be of the flush overlay design and, except as otherwise specified, be of Premium Grade construction and of component thickness in conformance with AWI Quality Standards.
- B. Fabricate casework of plastic laminated covered plywood or particleboard /as follows:
 1. Where shown, all semi-concealed surfaces to be plastic laminated.
 2. Horizontal and vertical reveals between doors and drawer for reveal overlay design to be 3/4 inch unless otherwise shown.
- C. Provide 18 gage) sheet steel sloping tops for casework where shown on construction drawings. Fasten sloping tops with oval-head screws inserted from interior. Exposed ends of sloping tops to have flush closures fastened as recommended by manufacturer

D. Support Members for Tops of Tables and Countertops:

1. Construct as detailed on construction documents.
2. Provide miscellaneous steel members and anchor as shown on construction drawings.

E. Legs For Counters:

1. Fabricate legs for counters of 0.0635 inch thick, 1-1/2 inch square tubular stainless steel.
2. Secure legs to counter tops and provide legs at bottom with shoes not less than 1 inch in height.
3. Fabricate shoes of stainless steel, aluminum or chromium plated brass.

2.10 PRODUCTS OF OTHER COMPONENTS DIRECTLY RELATED TO CASEWORK:

- A. Refer to Section 07 92 00, JOINT SEALANTS for work related to sealants used in conjunction with joints of countertops, casework systems, and adjacent materials.
- B. Refer to Section 09 65 13, RESILIENT BASE AND ACCESSORIES for work related to rubber base adhered to casework systems.
- C. Refer to Section 09 22 16, NON-STRUCTURAL METAL FRAMING for backing plates used in conjunction with wall assemblies for the attachment of casework systems.
- D. Refer to Section 12 36 11, COUNTERTOPS for work related to plastic laminate, acid-resistant plastic laminate, metal, molded resin, wood, and methyl methacrylic polymer countertops and/or shelving used in conjunction with casework systems. When countertop materials are provided by the casework manufacturer, they are to include the following features:
 1. Capable of being suspended from vertical support rails or horizontal wall strips or service modules.
 2. Provided with rounded corners and impact resistant material on exposed edges.
 3. Capable of being easily relocated and installed without tools.
 4. Capable of being suspended and easily changed under counter mounted storage units.
 5. Provide leveling adjustment capability so units can be brought into a level position.

6. Secured using fasteners. Show detail on shop drawings.
- E. Refer to Section 12 36 11, COUNTERTOPS for work related to and integral with countertop systems such as pegboards, funnel and graduate racks.
- F. Refer to Division 22, PLUMBING for the following work related to casework systems:
 1. Sinks, faucets and other plumbing service fixtures, venting, and piping systems.
 2. Compressed air, gas, vacuum and piping systems.
- G. Refer to Division 26, ELECTRICAL for the following work related to casework systems:
 1. Connections and wiring devices.
 2. Connections and lighting fixtures except when factory installed by the manufacturer.

PART 3 - EXECUTION

3.1 COORDINATION:

- A. Begin only after work of other trades is complete, including wall and floor finish completed, ceilings installed, light fixtures and diffusers installed and connected and area free of trash and debris.
- B. Verify location and size of mechanical and electrical services as required and perform cutting of components of work installed by other trades.
- C. Verify reinforcement of walls and partitions for support and anchorage of casework.
- D. Coordinate with other Divisions and Sections of the specification for work related to installation of casework systems to avoid interference and completion of service connections.

3.2 INSTALLATION:

- A. Install casework in accordance with manufacturer's written instructions and per SEFA 2.3 recommendations.
 1. Install in available space; arranged for safe and convenient operation and maintenance.
 2. Align cabinets for flush joints except where shown otherwise.
 3. Install with bottom of wall cabinets in alignment and tops of base cabinets aligned level, plumb, true, and straight to a tolerance of 3.2 mm in 1/8 inch in 96 inches.
 4. Install corner cabinets with hinges on corner side with filler or spacers sufficient to allow opening of drawers.

B. Support Rails:

1. Install true to horizontal at heights shown on construction documents; maximum tolerance for uneven floors is plus or minus 1/2 inch.
2. Shim as necessary to accommodate variations in wall surface not exceeding 3/16 inch at fastener.

C. Wall Strips:

1. Install true to vertical and spaced as shown on construction documents.
2. Align slots to assure that hanging units will be level.

D. Plug Buttons:

1. Install plug buttons in predrilled or prepunched perforations not used.
2. Use chromium plate plug buttons or buttons finish to match adjacent surfaces.

E. Seal junctures of casework systems with mildew-resistant silicone sealants as specified in Section 07 92 00, JOINT SEALANTS.

3.3. CLOSURES AND FILLER PLATES:

- A. Close openings larger than 1/4 inch wide between cabinets and adjacent walls with flat, steel closure strips, scribed to required contours, or machined formed steel fillers with returns, and secured with sheet metal screws to tubular or channel members of units, or bolts where exposed on inside.
- B. Where ceilings interfere with installation of sloping tops, omit sloping tops and provide flat steel filler plates.
- C. Secure filler plates to casework top members, unless shown otherwise on construction documents.
- D. Secure filler plates more than 6 inches in width top edge to a continuous 1 x 1 inch 1/16 inch thick steel formed steel angle with screws.
- E. Anchor angle to ceiling with toggle bolts.
- F. Install closure strips at exposed ends of pipe space and offset opening into concealed space.
- G. Finish closure strips and fillers with same finishes as cabinets.

3.4 FASTENINGS AND ANCHORAGE:

- A. Do not anchor to wood ground strips.
- B. Provide hat shape metal spacers where fasteners span gaps or spaces.
- C. Use 1/4 inch diameter toggle or expansion bolts, or other appropriate size and type fastening device for securing casework to walls or floor. Use expansion bolts shields having holding power beyond tensile and shear strength of bolt and breaking strength of bolt head.
- D. Use 1/4 inch diameter hex bolts for securing cabinets together.
- E. Use 1/4 inch by minimum 1-1/2 inch length lag bolt anchorage to wood blocking for concealed fasteners.
- F. Use not less than No. 12 or 14 wood screws with not less than 1-1/2 inch penetration into wood blocking.
- G. Space fastening devices 12 inches on center with minimum of three (3) fasteners in 915 or 3 or 4 foot) unit width.
- H. Anchor floor mounted cabinets with a minimum of four (4) bolts through corner gussets. Anchor bolts may be combined with or separate from leveling device.
- I. Secure cabinets in alignment with hex bolts or other internal fastener devices removable from interior of cabinets without special tools. Do not use fastener devices which require removal of tops for access.
- J. Where units abut end to end, anchor together at top and bottom of sides at front and back. Where units are back to back, anchor backs together at corners with hex bolts placed inconspicuously inside casework.
- K. Where type, size, or spacing of fastenings is not shown on construction documents or specified, show on shop drawings proposed fastenings and method of installation.

3.5 ADJUSTMENTS:

- A. Adjust equipment to insure proper alignment and operation.
- B. Replace or repair damaged or improperly operating materials, components or equipment.

3.6 CLEANING:

- A. Immediately following installation, clean each item, removing finger marks, soil and foreign matter.
- B. Remove from job site trash, debris and packing materials.
- C. Leave installed areas clean of dust and debris.

3.7 INSTRUCTIONS:

- A. Provide operational and cleaning manuals and verbal instructions in accordance with Article INSTRUCTIONS, SECTION 01 00 00, GENERAL REQUIREMENTS.
- B. Provide in service training both prior to and after facility opening. Coordinate in service activities with COR.
- C. Commencing at least seven (7) days prior to opening of facility, provide one (1) four (4) hour day of on-site orientation and technical instruction on use and cleaning procedures application to products and systems specified herein.

--- E N D ---

**SECTION 12 36 00
COUNTERTOPS**

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies casework countertops with under mount accessories.
- B. Under mount accessories include:
 - 1. Sinks with traps and drains.
 - 2. Eye and Face Wash Units. (NOT USED)
 - 3. Mechanical Service fixtures. (NOT USED)
 - 4. Electrical Receptacles. (NOT USED)
 - 5. Hot Plates (Range) (NOT USED)
 - 6. Pegboards (NOT USED)

1.2 RELATED WORK

- A. Color and patterns of plastic laminate: SECTION 09 06 00, SCHEDULE FOR FINISHES.
- B. DIVISION 22, PLUMBING.
- C. DIVISION 26, ELECTRICAL.
- D. Equipment Reference Manual for SECTION 12 36 00, COUNTERTOPS.

1.3 SUBMITTALS

- A. Submit in accordance with SECTION 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings
 - 1. Show dimensions of section and method of assembly.
 - 2. Show details of construction at a scale of ½ inch to a foot.
- C. Samples:
 - 1. 6 inch square samples each top.
 - 2. Front edge, back splash, end splash and core with surface material and booking.

1.4 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to the extent referenced.
Publications are referenced in the text by the basic designation only.
- B. American Hardboard Association (AHA):

- A135.4-95.....Basic Hardboard
- C. Composite Panel Association (CPA):
 - A208.1-09.....Particleboard
- D. American Society of Mechanical Engineers (ASME):
 - A112.18.1-12.....Plumbing Supply Fittings
 - A112.1.2-12.....Air Gaps in Plumbing System
 - A112.19.3-08(R2004)Stainless Steel Plumbing Fixtures (Designed for Residential Use)
- E. American Society for Testing and Materials (ASTM):
 - A167-99 (R2009)Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip
 - A1008-10.....Steel, Sheet, Cold-Rolled, Carbon, Structural, High Strength, Low Alloy
 - D256-10.....Pendulum Impact Resistance of Plastic
 - D570-98(R2005)Water Absorption of Plastics
 - D638-10.....Tensile Properties of Plastics
 - D785-08.....Rockwell Hardness of Plastics and Electrical Insulating Materials
 - D790-10.....Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
 - D4690-99(2005)Urea-Formaldehyde Resin Adhesives
- F. Federal Specifications (FS):
 - A-A-1936Adhesive, Contact, Neoprene Rubber
- G. U.S. Department of Commerce, Product Standards (PS):
 - PS 1-95Construction and Industrial Plywood
- H. National Electrical Manufacturers Association (NEMA):
 - LD 3-05High Pressure Decorative Laminates

PART 2 - PRODUCTS

2.1 MATERIALS

A. Molded Resin:

1. Non-glare epoxy resin or furan resin compounded and cured for minimum physical properties specified:

Flexural strength	70 MPa (10,000 psi)	ASTM D790
Rockwell hardness	105	ASTM D785
Water absorption, 14 hours (weight)	.01%	ASTM D570

2. Material of uniform mixture throughout.

I. Adhesive

1. For Field Joints:
 - a. Epoxy type, resistant to chemicals as specified for plastic laminate laboratory surfaces.
 - b. Fungi resistant: ASTM G-21, rating of 0.

J. Fasteners:

1. Metals used for welding same metal as materials joined.
2. Use studs, bolts, spaces, threaded rods with nuts or screws suitable for materials being joined with metal splice plates, channels or other supporting shape.

K. Solid Polymer Material:

1. Filled Methyl Methacrylic Polymer.
2. Performance properties required:

Property	Result	Test
Elongation	0.3% min.	ASTM D638
Hardness	90 Rockwell M	ASTM D785
Gloss (60° Gordon)	5-20	NEMA LD3.1
Color stability	No change	NEMA LD3 except 200 hour
Abrasion resistance	No loss of pattern Max wear depth 00.003 in) - 10000 cycles	NEMA LD3

Property	Result	Test
Water absorption weight (5 max)	24 hours 0.9	ASTM D-570
Izod impact	14 N·m/m (0.25 ft-lb/in)	ASTM D256 (Method A)
Impact resistance	No fracture	NEMA LD-3 36") drop 1 kg (2 lb.) ball
Boiling water surface resistance	No visible change	NEMA LD3
High temperature resistance	Slight surface dulling	NEMA LD3

3. Cast into sheet form and bowl form.
4. Color throughout with subtle veining through thickness.
5. Joint adhesive and sealer: Manufacturers silicone adhesive and sealant for joining methyl methacrylic polymer sheet.
6. Bio-based products will be preferred.

L. Laminar Flow Control Device

1. Smooth bright stainless steel or satin finish, chrome plated metal laminar flow device shall provide non-aeration, clear, coherent laminar flow that will not splash in basin. Device shall also have a flow control restrictor and have vandal resistant housing.
2. Flow Control Restrictor:
 - a. Capable of restricting flow of 2.0 to 2.2 gpm) for sinks provided in paragraph 2.2D.
 - b. Compensates for pressure fluctuation maintaining flow rate specified above within 10 percent between 175 and 550 kPa (25 and 80 psi).
 - c. Operates by expansion and contraction, eliminates mineral/sediment building up with self clearing action, and is capable of easy manual cleaning.

2.2 SINKS

A. Stainless Steel:

1. ANSI/ASME A112.19.3, Type 304.
 2. Self rim for plastic laminate or similar tops with concealed fasteners.
 3. Flat rim for welded into stainless steel tops.
 4. Ledge back or ledge sides with holes to receive required fixtures when mounted on countertop.
 5. Apply fire resistant sound deadening material to underside.
- C. Stainless steel circular or oval shaped bowl.

2.3 TRAPS AND FITTINGS

- A. Material as specified in DIVISION 22, PLUMBING.
- C. For Stainless Steel Sinks:
1. Either cast or wrought brass or stainless steel P-traps and drain fittings; ASME A112.18.1
 2. Flat strainer, except where cup strainer or overflow standpipe specified.
 - a. Provide cup strainer in cabinet type 1B.
 - b. Provide stainless steel overflow stand pipe to within 1-1/2 inches of sink rim.
 3. Exposed surface chromium plated finish.
- D. Plaster traps:
1. Cast iron body with porcelain enamel exterior finish.
 2. 2 inch female threaded side inlet and outlet.
 3. Removable galvanized cage having integral baffles and replaceable brass screens.
 4. Removable gasketed cover.
 5. Minimum overall dimensions: 350 x 350 x 400 mm high (14 x 14 x 16 inches with 7 inch water seal.
 6. Non-siphoning and easily accessible for cleaning.
- E. Air Gap Fittings: ASME A112.1.2.

2.4 WATER FAUCETS

- A. ASME A112.18.1.
1. Cast or forged brass, compression type with replaceable seat and stem assembly or replaceable cartridge.

2. Indexed lever handles either with or without head.
 3. Gooseneck minimum clearance above countertop of 7-1/2 inches, bent 180 degrees for vertical discharge.
 4. Swing spouts elevated to clear handles.
 5. Exposed brass surfaces chromium plated.
 6. Cast combination hot and cold fixture with one piece body for multiple outlets.
 7. Adapter type connection which will permit field conversion of swing spouts to fixed or gooseneck grouts or vice versa.
 8. Pedestals Top for Laboratory or Pharmacy:
 - a. Modern design tapered to a round base, factory assembled and tested.
 - b. Brass shanks, locknuts and washers for attaching to top or curbs.
- B. Laminar flow control device on spouts.
- C. Automatic Controlled Faucets.
1. Infra-red photocell sensor and a solenoid valve to control water flow automatically.
 2. Breaking light beam activates water flow.
 3. Water stops when user moves away from light beam.
- C. Laboratory and Pharmacy Faucets:
1. Female 3/8 inch IPS threaded outlet for attachment of filter pumps, hose connectors, anti-hose nozzle, or laminar flow control device on spout end.
 2. Provide angle type vacuum breaker for fixture, designed for low flow, with built-in floating disk and renewable seat in vacuum breaker body.
- D. Distilled Water Fixture:
1. Deck mounted.
 2. Gooseneck spout with handle arranged for self closing and with hold open feature to open and close an inert silicone diaphragm valve.
 3. Faucet designed to be chemically inert and resistant to leaching of inorganic contaminants, enhancement of bacteria growth, and internal corrosion.
- E. Eye and Face Wash Unit Pull-Out-Type:
1. Deck mounted.

2. Designed for vandal resistant push-down control valve and 6 foot hose.
 3. Eye and face wash head, provide a soft stream for flushing action.
 4. Valve, when opened; remain open until manually closed.
- F. Eye and Face Bath, Counter Mounted:
1. Stainless Steel circular or oval shaped self rimmed sink, as shown on drawings.
 2. Two fully enclosed rubber bound spray heads to provide an aerated flow of water simultaneously into both eyes and across face.
 3. Push-pull hand operated valve.
 4. Volume regulator for each spray.
- G. Manifold, Tube-Washing:
1. Deck mounted
 2. Three valved outlet, plus one bleeder outlet.
 3. Vacuum breaker, and loose key stops with integral check valve.
- H. Vanity or Lavatory Faucets in Methyl Methacrylic Polymer tops:
1. Extra long center set single lever handle control.
 2. Cast or wrought copper alloy, vandal resistant.
 3. Stainless steel ball type with replaceable non-metallic seats, stainless steel lined sockets.
 4. Handle always returning to the neutral position or cartridge body construction.
 5. Provide laminar flow control device.

2.5 FUEL GAS, LABORATORY AIR AND LABORATORY VACUUM FIXTURES

- A. Comply with criteria for faucets except as specified.
- B. Needle valves with stainless steel replaceable cone and valve seat.
- C. Provide valve with a bonnet with exterior packing and packing gland designed to permit valve to be repacked while under pressure.
- D. Valves withstand a minimum pressure of 700 kPa (100 psi) without leakage.
- E. Equip valves with four-arm handles and serrated hose ends. Do not provide laminar flow control device.
- F. Provide duplex fixtures except where otherwise shown.

G. Factory assembled and tested.

2.6 FIXTURE IDENTIFICATION

A. Code fixtures with full view plastic index buttons.

B. Use following colors and codes:

SERVICE	COLOR	CODE	COLOR OF LETTERS
Cold Water	Dark Green	CW	White
Hot Water	Red	HW	White
Laboratory Air	Orange	AIR	Black
Fuel Gas	Dark Blue	GAS	White
Laboratory Vacuum	Yellow	VAC	Black
Distilled Water	White	DW	Black
Deionized Water	White	DI	Black
Oxygen	Light Green	OXY	White
Hydrogen	Pink	H	Black
Nitrogen	Gray	N	Black
All Other Gases	Light Blue	CHEM.SYM.	Black

2.7 ELECTRICAL RECEPTACLES

A. Hospital grade per electrical specifications.

B. Curb Mounted Receptacles:

1. NEMA 5-20R duplex in galvanized steel box.
2. Chromium plated brass or steel face plate.

C. Pedestal Mounted Receptacles:

1. NEMA 5-20R duplex installed in double faces.
2. Polished stainless steel or aluminum, or chromium plated brass pedestal.2.10

COUNTERTOPS

A. Fabricate in largest sections practicable.

B. Fabricate with joints flush on top surface.

C. Fabricate countertops to overhang front of cabinets and end of assemblies one inch except where against walls or cabinets.

- D. Provide 0.039 inch thick metal plate connectors or fastening devices (except epoxy resin tops).
- E. Join edges in a chemical resistant waterproof cement or epoxy cement, except weld metal tops.
- F. Fabricate with end splashes where against walls or cabinets.
- G. Splash Backs and End Splashes:
 - 1. Not less than 3/4 inch thick.
 - 2. Height 4 inches unless noted otherwise.
 - 3. Laboratories and pharmacy heights or where fixtures or outlets occur: Not less than 6 inches unless noted otherwise.
 - 4. Fabricate epoxy splash back in maximum lengths practical of the same material.
- H. Drill or cutout for sinks, and penetrations.
 - 1. Accurately cut for size of penetration.
 - 2. Cutout for VL 81 photographic enlarger cabinet.
 - a. Finish cutout to fit flush with vertical side of cabinet, allowing adjustable shelf to fit into cutout space of cabinet at counter top level. Finish cutout surface as an exposed edge.
 - b. Provide braces under enlarger space to support not less than 45 kg (100 pounds) centered on opening side along backsplash.
- I. Plastic Laminate Countertops:
 - 1. Fabricate plastic laminate on five-ply plywood or particleboard core 3/4 inch thick with plastic laminate backing sheet.
 - 2. Front edge over cabinets not less than 1-1/2 inches thick except where plastic "T" insert is used, not less than 3/4 inch thick.
 - 3. Exposed Surface and edges of decorative laminated plastic or laboratory chemical resistant surface.
 - a. Use chemical resistant surface on tops 6A, 6B, and 6C.
 - b. Use decorative surface tops when noted plastic laminate, for tops 10A, 10B and 10C.

J. Metal Counter Tops:

1. Fabricate up to 12 feet long in one piece, including nosing, backs and ends.
2. When counter tops exceed 12 feet in length accurately fitted field joints are acceptable.
3. Finish thickness at edges 1-1/4 inch.
4. Reinforced with minimum 0.0598 inch thick hat channel stiffeners, minimum of two stiffeners for units without sinks and three stiffeners for units with sinks welded or soldered to underside of top full length, except at sink openings.
5. Apply sound deadening material on underside.
6. Flange edges of tops down 1-1/4 inch and reinforce with concealed hardwood or with a steel frame.
7. Grind welds smooth and finished on exposed surfaces to match finish specified.
8. Stainless Steel Counter or Sink Tops:
 - a. Where noted stainless steel except where specified for nourishment unit, unit kitchen, and medicine cabinet.
 - b. Use 0.0598 inch thick stainless steel.
 - c. Depth of splash backs and splash ends one inch and turned down at least 1/2 inch at wall. Where faucets are located in splash backs, fabricate depth of splash backs 2 inches with provision made to receive required fixture.
 - d. Where sinks occur fabricate top with 3/16 inch marine edge and fit flush with adjacent tops of other materials.
 - e. Weld sink flush to counter top and finish to appear seamless.

K. Molded Resin Tops:

1. Molded resin with drip groove cut on underside of overhanging edge.
2. Finish thickness of top minimum 1 inch.
3. Joints: Epoxy Type.
4. Secure reagent shelves to counter tops with fasteners from underside and seal seam.

L. Maple tops:

1. Fabricate in one piece of solid laminated tongue and groove maple strips, not more than three inches in width, glued under pressure to a thickness 1-3/4 inches.
 2. Edges and ends of clear maple wood. Make splash backs and splash ends of 3/4 inch thick maple and secure to counter tops with concealed metal fasteners and with contact surfaces set in waterproof glue.
 3. Round exposed edges of maple tops and backs to approximate 3/8 inch radius.
 4. Sand exposed surfaces smooth and even and apply two coats of boiled linseed oil. Rub in each coat and allow 48 hours to lapse between coats.
- M. Laboratory Shelf 8 inches deep: Fabricate of 1-1/16 inch thick hardwood. Finish with black acid resisting enamel.
- N. Laboratory Shelf with Funnel and Graduate Rack 12 inches deep shelf: Fabricate of 1-1/16 inch thick hardwood. Finish with black acid resisting enamel.
- O. Laboratory Shelf 10 inch deep): Fabricate of corrosion resisting steel.
- P. Pegboards:
1. Pegboard: Fabricate of birch with black acid resisting finish and equip with polypropylene or unfinished hardwood pegs.
 2. Pegboard with Funnel and Graduate Rack: Fabricate of birch with black acid resisting finish and equip with polypropylene or unfinished hardwood pegs. Support rack on steel brackets. Provide CRS gutter and drain to sink.
- Q. Methyl Methacrylic Polymer Tops:
1. Fabricate countertop of methyl methacrylic polymer cast sheet, 1/2 inch thick.
 2. Fabricate back splash and end splash to height shown.
 3. Fabricate skirt to depth shown.
 4. Fabricate with marine edge where sinks occur.
 5. Fabricate in one piece for full length from corner to corner up to 12 feet.
 6. Join pieces with adhesive sealant.
 7. Cut out countertop for lavatories, plumbing trim.
 8. Provide concealed fasteners and epoxy cement for anchorage of sinks to countertop.

- R. Counter Tops for Interchangeable Furniture: Counter tops, unless otherwise shown, are to be capable of vertical adjustment of 6 inches. Fabricate tops, except CRS, in increments of units over which they fit with maximum length not to exceed 78 inches. Top section shall cover as many cabinet units as possible. Horizontal joints in counter tops at service strip and across depth of counter are to be watertight when in place but of a type that can be easily separated and reset when counter top is moved up or down. Fabricate CRS tops in maximum lengths practicable, with field joints welded and ground smooth to match adjacent surfaces. Securely fasten to supporting rails with heavy metal fastening devices, or with screws, through pierced slots in such rails. Fabricate vertical splash back and reagent shelf in maximum length practicable of same material as working surface, except finish thickness shall be 3/4 inch.

- S. Countertop products shall comply with following standards for biobased materials:

Material Type	Percent by Weight
Composite Panel	89 percent biobased material
Hardwood	89 percent biobased material
Particleboard	89 percent biobased material
Plywood	89 percent biobased material

The minimum-content standards are based on the weight (not the volume) of the material in the insulating core only.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Before installing countertops verify that wall surfaces have been finished as specified and that mechanical and electrical service locations are as required.
- B. Secure countertops to supporting rails of cabinets with metal fastening devices, or screws through pierced slots in rails.
1. Where type, size or spacing of fastenings is not shown or specified, submit shop drawings showing proposed fastenings and method of installation.
 2. Use round head bolts or screws.
 3. Use epoxy or silicone to fasten the epoxy resin countertops to the cabinets.

4. Use wood or sheet metal screws for wood or plastic laminate tops; minimum penetration into top 5/8 inch, screw size No 8, or 10.

C. Rubber Moldings:

1. Where shown install molding with butt joints in horizontal runs and mitered joints at corners where ceramic tile occurs omit molding.
2. Fasten molding to wall and to splashbacks and splashends with adhesive.

D. Sinks

1. Install stainless steel sink in plastic laminate tops with epoxy compound to form watertight seal under shelf rim.
 - a. In laboratory and pharmacy fit stainless steel sink with overflow standpipe.
 - b. Install faucets and fittings on sink ledges with watertight seals where shown.

E. Faucets, Fixtures, and Outlets:

1. Seal opening between fixture and top.
2. Secure to top with manufacturers standard fittings.

F. Range Tops, Electrical Outlets, Film Viewer:

1. Set in cutouts with manufacturers gasket sealing joint with top to prevent water leakage.
2. Install control unit and electric outlets where shown. Seal escutcheon plate at lap if on counter or top to prevent water leakage.

3.2 PROTECTION AND CLEANING

- A. Tightly cover and protect against dirt, water, and chemical or mechanical injury.
- B. Clean at completion of work.

--- E N D ---

SECTION 13 05 41
SEISMIC RESTRAINT REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS

PART 1 – GENERAL

1.1 DESCRIPTION:

- A. Provide seismic restraint in accordance with the requirements of this section in order to maintain the integrity of nonstructural components of the building so that they remain safe and functional in case of seismic event.
- B. The design to resist seismic load shall be based on Seismic Design Categories per section 4.0 of the VA Seismic Design Requirements (H-18-8) dated August 2013, <http://www.cfm.va.gov/til/etc/seismic.pdf>.
- C. Definitions: Non-structural building components are components or systems that are not part of the building's structural system whether inside or outside, above or below grade. Non-structural components of buildings include:
 - 1. Architectural Elements: Facades that are not part of the structural system and its shear resistant elements; cornices and other architectural projections and parapets that do not function structurally; glazing; nonbearing partitions; suspended ceilings; stairs isolated from the basic structure; cabinets; bookshelves; medical equipment; and storage racks.
 - 2. Electrical Elements: Power and lighting systems; substations; switchgear and switchboards; auxiliary engine-generator sets; transfer switches; motor control centers; motor generators; selector and controller panels; fire protection and alarm systems; special life support systems; and telephone and communication systems.
 - 3. Mechanical Elements: Heating, ventilating, and air-conditioning systems; medical gas systems; plumbing systems; sprinkler systems; pneumatic systems; boiler equipment and components.
 - 4. Transportation Elements: Mechanical, electrical and structural elements for transport systems, i.e., elevators and dumbwaiters, including hoisting equipment and counterweights.

1.2 QUALITY CONTROL:

A. Shop-Drawing Preparation:

1. Have seismic-force-restraint shop drawings and calculations prepared by a professional structural engineer experienced in the area of seismic force restraints. The professional structural engineer shall be registered in the state where the project is located.
2. Submit design tables and information used for the design-force levels, stamped and signed by a professional structural engineer registered in the State where project is located.

B. Coordination:

1. Do not install seismic restraints until seismic restraint submittals are approved by the Resident Engineer.
2. Coordinate and install trapezes or other multi-pipe hanger systems prior to pipe installation.

C. Seismic Certification:

In structures assigned to IBC Seismic Design Category C, D, E, or F, permanent equipments and components are to have Special Seismic Certification in accordance with requirements of section 13.2.2 of ASCE 7 except for equipment that are considered rugged as listed in section 2.2 OSHPD code application notice CAN No. 2-1708A.5, and shall comply with section 13.2.6 of ASCE 7.

1.3 SUBMITTALS:

A. Submit a coordinated set of equipment anchorage drawings prior to installation including:

1. Description, layout, and location of items to be anchored or braced with anchorage or brace points noted and dimensioned.
2. Details of anchorage or bracing at large scale with all members, parts brackets shown, together with all connections, bolts, welds etc. clearly identified and specified.

3. Numerical value of design seismic brace loads.
 4. For expansion bolts, include design load and capacity if different from those specified.
- B. Submit prior to installation, a coordinated set of bracing drawings for seismic protection of piping, with data identifying the various support-to-structure connections and seismic bracing structural connections, include:
1. Single-line piping diagrams on a floor-by-floor basis. Show all suspended piping for a given floor on the same plain.
 2. Type of pipe (Copper, steel, cast iron, insulated, non-insulated, etc.).
 3. Pipe contents.
 4. Structural framing.
 5. Location of all gravity load pipe supports and spacing requirements.
 6. Numerical value of gravity load reactions.
 7. Location of all seismic bracing.
 8. Numerical value of applied seismic brace loads.
 9. Type of connection (Vertical support, vertical support with seismic brace etc.).
 10. Seismic brace reaction type (tension or compression): Details illustrating all support and bracing components, methods of connections, and specific anchors to be used.
- C. Submit prior to installation, bracing drawings for seismic protection of suspended ductwork and suspended electrical and communication cables, include:
1. Details illustrating all support and bracing components, methods of connection, and specific anchors to be used.
 2. Numerical value of applied gravity and seismic loads and seismic loads acting on support and bracing components.
 3. Maximum spacing of hangers and bracing.
 4. Seal of registered structural engineer responsible for design.
- D. Submit design calculations prepared and sealed by the registered structural engineer specified above in paragraph 1.3A.

- E. Submit for concrete anchors, the appropriate ICBC evaluation reports, OSHPD pre-approvals, or lab test reports verifying compliance with OSHPD Interpretation of Regulations 28-6.

1.4 APPLICABLE PUBLICATIONS:

- A. The Publications listed below (including amendments, addenda revisions, supplements and errata) form a part of this specification to the extent referenced. The publications are referenced in text by basic designation only.
- B. American Concrete Institute (ACI):
355.2-07Qualification for Post-Installed Mechanical Anchors in
Concrete and Commentary
- C. American Institute of Steel Construction (AISC):
Load and Resistance Factor Design, Volume 1, Second Edition
- D. American Society for Testing and Materials (ASTM):
A36/A36M-08.....Standard Specification for Carbon Structural Steel
A53/A53M-10.....Standard Specification for Pipe, Steel, Black and Hot-
Dipped, Zinc-Coated, Welded and Seamless
A307-10.....Standard Specification for Carbon Steel Bolts and Studs;
60,000 PSI Tensile Strength.
A325-10.....Standard Specification for Structural Bolts, Steel, Heat
Treated, 120/105 ksi Minimum Tensile Strength
A325M-09Standard Specification for High-Strength Bolts for
Structural Steel Joints [Metric]
A490-10.....Standard Specification for Heat-Treated Steel Structural
Bolts, 150 ksi Minimum Tensile Strength
A490M-10Standard Specification for High-Strength Steel Bolts,
Classes 10.9 and 10.9.3, for Structural Steel Joints [Metric]
A500/A500M-10Standard Specification for Cold-Formed Welded and
Seamless Carbon Steel Structural Tubing in Rounds and
Shapes

A501-07Specification for Hot-Formed Welded and Seamless
Carbon Steel Structural Tubing
A615/A615M-09Standard Specification for Deformed and Plain Billet-Steel
Bars for Concrete Reinforcement
A992/A992M-06Standard Specification for Steel for Structural Shapes for
Use in Building Framing
A996/A996M-09Standard Specification for Rail-Steel and Axle-Steel
Deformed Bars for Concrete Reinforcement
E488-96(R2003)Standard Test Method for Strength of Anchors in Concrete
and Masonry Element

- E. American Society of Civil Engineers (ASCE 7) Latest Edition.
- F. International Building Code (IBC) Latest Edition
- G. VA Seismic Design Requirements, H-18-8, August 2013
- H. National Uniform Seismic Installation Guidelines (NUSIG)
- I. Sheet Metal and Air Conditioning Contractors National Association
(SMACNA): Seismic Restraint Manual - Guidelines for Mechanical Systems, 1998 Edition
and Addendum

1.5 REGULATORY REQUIREMENT:

- A. IBC Latest Edition.
- B. Exceptions: The seismic restraint of the following items may be omitted:
 - 1. Equipment weighing less than 400 pounds, which is supported directly on the floor or roof.
 - 2. Equipment weighing less than 20 pounds, which is suspended from the roof or floor or hung from a wall.
 - 3. Gas and medical piping less than 2 ½ inches inside diameter.
 - 4. Piping in boiler plants and equipment rooms less than 1 ¼ inches inside diameter.
 - 5. All other piping less than 2 ½ inches inside diameter, except for automatic fire suppression systems.

6. All piping suspended by individual hangers, 12 inches or less in length from the top of pipe to the bottom of the support for the hanger.
7. All electrical conduits, less than 2 ½ inches inside diameter.
8. All rectangular air handling ducts less than six square feet in cross sectional area.
9. All round air handling ducts less than 28 inches in diameter.
10. All ducts suspended by hangers 12 inches or less in length from the top of the duct to the bottom of support for the hanger.

PART 2 – PRODUCTS

2.1 STEEL:

- A. Structural Steel: ASTM A36
- B. Structural Tubing: ASTM A500, Grade B.
- C. Structural Tubing: ASTM A501.
- D. Steel Pipe: ASTM A53/A53M, Grade B.
- E. Bolts & Nuts: ASTM A307

2.2 CAST-IN-PLACE CONCRETE:

- A. Concrete: 28 day strength, $f'c = 25$ MPa (3,000 psi)
- B. Reinforcing Steel: ASTM A615/615M or ASTM A996/A996M deformed.

PART 3 – EXECUTION

3.1 CONSTRUCTION, GENERAL:

- A. Provide equipment supports and anchoring devices to withstand the seismic design forces, so that when seismic design forces are applied, the equipment cannot displace, overturn, or become inoperable.
- B. Provide anchorages in conformance with recommendations of the equipment manufacturer and as shown on approved shop drawings and calculations.
- C. Construct seismic restraints and anchorage to allow for thermal expansion.
- D. Testing Before Final Inspection:
 1. Test 10-percent of anchors in masonry and concrete per ASTM E488, and ACI 355.2 to determine that they meet the required load capacity. If any anchor fails to meet

the required load, test the next 20 consecutive anchors, which are required to have zero failure, before resuming the 10-percent testing frequency.

2. Before scheduling Final Inspection, submit a report on this testing indicating the number and location of testing, and what anchor-loads were obtained.

3.2 EQUIPMENT RESTRAINT AND BRACING:

- A. See drawings for equipment to be restrained or braced.

3.3 MECHANICAL DUCTWORK AND PIPING; BOILER PLANT STACKS AND BREACHING; ELECTRICAL BUSWAYS, CONDUITS, AND CABLE TRAYS; AND TELECOMMUNICATION WIRES AND CABLE TRAYS

- A. Support and brace mechanical ductwork and piping; electrical busways, conduits and cable trays; and telecommunication wires and cable trays including boiler plant stacks and breeching to resist directional forces (lateral, longitudinal and vertical).
- B. Brace duct and breeching branches with a minimum of 1 brace per branch.
- D. Provide supports and anchoring so that, upon application of seismic forces, piping remains fully connected as operable systems which will not displace sufficiently to damage adjacent or connecting equipment, or building members.
- E. Seismic Restraint of Piping:
 1. Design criteria:
 - a. Piping resiliently supported: Restrain to support 120-percent of the weight of the systems and components and contents.
 - b. Piping not resiliently supported: Restrain to support 60-percent of the weight of the system components and contents.
 2. Provide seismic restraints according to one of the following options:
- F. Piping Connections: Provide flexible connections where pipes connect to equipment. Make the connections capable of accommodating relative differential movements between the pipe and equipment under conditions of earthquake shaking.

3.4 PARTITIONS

- A. In buildings with flexible structural frames, anchor partitions to only structural element, such as a floor slab, and separate such partition by a physical gap from all other structural elements.
- B. Properly anchor masonry walls to the structure for restraint, so as to carry lateral loads imposed due to earthquake along with their own weight and other lateral forces.

3.5 CEILINGS AND LIGHTING FIXTURES

- A. At regular intervals, laterally brace suspended ceilings against lateral and vertical movements, and provide with a physical separation at the walls.
- B. Independently support and laterally brace all lighting fixtures. Refer to applicable portion of lighting specification, Section 26 51 00, INTERIOR LIGHTING.

3.6 FACADES AND GLAZING

- A. Do not install concrete masonry unit filler walls in a manner that can restrain the lateral deflection of the building frame. Provide a gap with adequately sized resilient filler to separate the structural frame from the non-structural filler wall.
- B. Tie brick veneers to a separate wall that is independent of the steel frame as shown on construction drawings to ensure strength against applicable seismic forces at the project location.
- C. Install attachments to structure for all façade materials as shown on construction drawings to ensure strength against applicable seismic forces at the project location.

3.7 STORAGE RACKS, CABINETS, AND BOOKCASES

- A. Install storage racks to withstand earthquake forces and anchored to the floor or laterally braced from the top to the structural elements.
- B. Anchor medical supply cabinets to the floor or walls and equip them with properly engaged, lockable latches.
- C. Anchor filing cabinets that are more than 2 drawers high to the floor or walls, and equip all drawers with properly engaged, lockable latches.
- D. Anchor bookcases that are more than 30 inches high to the floor or walls, and equip any doors with properly engaged, lockable latches.

CONSTRUCT PRIMARY CARE / MENTAL HEALTH BUILDING
BOISE VA MEDICAL CENTER - BOISE, ID

PROJECT #: 531-325
CONSTRUCTION DOCUMENTS

--- E N D ---

SECTION 21 13 13
WET-PIPE SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Design, installation and testing shall be in accordance with NFPA 13.
- B. The design and installation of a hydraulically calculated automatic wet-pipe system complete and ready for operation, for all portions of Primary Care, Mental Health Building, including the penthouse, attic space.

1.2 RELATED WORK

- A. Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Section 33 10 00, WATER UTILITIES.
- C. Section 07 84 00, FIRESTOPPING.
- D. Section 09 51 00, ACOUSTICAL CEILING
- E. Section 09 91 00, PAINTING.
- F. Section 22 05 23, GENERAL-DUTY VALVES FOR PLUMBING PIPING.
- G. Section 28 31 00, FIRE DETECTION AND ALARM.

1.3 DESIGN CRITERIA

- A. Design Basis Information: Provide design, materials, equipment, installation, inspection, and testing of the automatic sprinkler system in accordance with the requirements of NFPA 13.
 - 1. Perform hydraulic calculations in accordance with NFPA 13 utilizing the Area/Density method. Do not restrict design area reductions permitted for using quick response sprinklers throughout by the required use of standard response sprinklers in the areas identified in this section.
 - 2. Sprinkler Protection: Sprinkler hazard classifications shall be in accordance with NFPA 13. The hazard classification examples of uses and conditions identified in the Annex of NFPA 13 shall be mandatory for areas not listed below. Request

- clarification from the Government for any hazard classification not identified. To determining spacing and sizing, apply the following coverage classifications:
- a. Light Hazard Occupancies: Patient care, treatment, and customary access areas.
 - b. Ordinary Hazard Group 1 Occupancies: Laboratories, Mechanical Equipment Rooms, Transformer Rooms, Electrical Switchgear Rooms, Electric Closets, and Repair Shops.
 - c. Ordinary Hazard Group 2 Occupancies: Storage rooms, trash rooms, clean and soiled linen rooms, pharmacy and associated storage, laundry, kitchens, kitchen storage areas, retail stores, retail store storage rooms, storage areas, building management storage, boiler plants, energy centers, warehouse spaces, file storage areas for the entire area of the space up to 140 square meters (1500 square feet) and Supply Processing and Distribution (SPD).
3. Hydraulic Calculations: Calculated demand including hose stream requirements shall fall no less than 10 percent below the available water supply curve.
 4. Water Supply: Base water supply on a flow test of:
 - a. Location Building 110 1st floor
 - d. Static pressure: 655 kPa (95 psi)
 - e. Residual pressure: 414 kPa (60 psi)
 - g. Date: March 19th
 5. Zoning:
 - a. For each sprinkler zone provide a control valve, flow switch, and a test and drain assembly with pressure gauge. For buildings greater than two stories, provide a check valve at each control valve.
 - b. Sprinkler zones shall conform to the smoke barrier zones shown on the drawings.
 6. Provide seismic protection in accordance with NFPA 13. Contractor shall submit load calculations for sizing of sway bracing for systems that are required to be protected against damage from earthquakes.

1.4 SUBMITTALS

A. Submit as one package in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES. Prepare detailed working drawings that are signed by a NICET Level III or Level IV Sprinkler Technician or stamped by a Registered Professional Engineer licensed in the field of Fire Protection Engineering. As the Government review is for technical adequacy only, the installer remains responsible for correcting any conflicts with other trades and building construction that arise during installation. Partial submittals will not be accepted. Material submittals shall be approved prior to the purchase or delivery to the job site. Suitably bind submittals in notebooks or binders and provide an index referencing the appropriate specification section. In addition to the hard copies, provide submittal items in Paragraphs 1.4(A)1 through 1.4(A)5 electronically in pdf format on a compact disc or as directed by the COR. Submittals shall include, but not be limited to, the following:

1. Qualifications:
 - a. Provide a copy of the installing contractors fire sprinkler and state contractor's license.
 - b. Provide a copy of the NICET certification for the NICET Level III or Level IV Sprinkler Technician who prepared and signed the detailed working drawings unless the drawings are stamped by a Registered Professional Engineer licensed in the field of Fire Protection Engineering.
 - c. Provide documentation showing that the installer has been actively and successfully engaged in the installation of commercial automatic sprinkler systems for the past ten years.
2. Drawings: Submit detailed 1:100 (1/8 inch) scale (minimum) working drawings conforming to the Plans and Calculations chapter of NFPA 13. Drawings shall include graphical scales that allow the user to determine lengths when the drawings are reduced in size. Include a plan showing the piping to the water supply test location.
3. Manufacturer's Data Sheets: Provide data sheets for all materials and equipment proposed for use on the system. Include listing information and installation

instructions in data sheets. Where data sheets describe items in addition to those proposed to be used for the system, clearly identify the proposed items on the sheet.

4. Calculation Sheets:
 - a. Submit hydraulic calculation sheets in tabular form conforming to the requirements and recommendations of the Plans and Calculations chapter of NFPA 13.
 - b. Submit calculations of loads for sizing of sway bracing in accordance with NFPA 13.
5. Valve Charts: Provide a valve chart that identifies the location of each control valve. Coordinate nomenclature and identification of control valves with COR. Where existing nomenclature does not exist, the chart shall include no less than the following: Tag ID No., Valve Size, Service (control valve, main drain, aux. drain, inspectors test valve, etc.), and Location.
6. Final Document Submittals: Provide as-built drawings, testing and maintenance instructions in accordance with the requirements in Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES. In addition, submittals shall include, but not be limited to, the following:
 - a. A complete set of as-built drawings showing the installed system with the specific interconnections between the system switches and the fire alarm equipment. Provide a complete set in the formats as follows. Submit items 2 and 3 below on a compact disc or as directed by the COR.
 - 1) One full size (or size as directed by the COR) printed copy.
 - 2) One complete set in electronic pdf format.
 - 3) One complete set in AutoCAD format or a format as directed by the COR.
 - b. Material and Testing Certificate: Upon completion of the sprinkler system installation or any partial section of the system, including testing and flushing, provide a copy of a completed Material and Testing Certificate as indicated in NFPA 13. Certificates shall be provided to document all parts of the installation.

- c. Operations and Maintenance Manuals that include step-by-step procedures required for system startup, operation, shutdown, and routine maintenance and testing. The manuals shall include the manufacturer's name, model number, parts list, and tools that should be kept in stock by the owner for routine maintenance, including the name of a local supplier, simplified wiring and controls diagrams, troubleshooting guide, and recommended service organization, including address and telephone number, for each item of equipment.
- d. One paper copy of the Material and Testing Certificates and the Operations and Maintenance Manuals above shall be provided in a binder. In addition, these materials shall be provided in pdf format on a compact disc or as directed by the COR.
- e. Provide one additional copy of the Operations and Maintenance Manual covering the system in a flexible protective cover and mount in an accessible location adjacent to the riser or as directed by the COR.

1.5 QUALITY ASSURANCE

- A. Installer Reliability: The installer shall possess a valid State of Idaho fire sprinkler contractor's license. The installer shall have been actively and successfully engaged in the installation of commercial automatic sprinkler systems for the past ten years.
- B. Materials and Equipment: All equipment and devices shall be of a make and type listed by UL or approved by FM, or other nationally recognized testing laboratory for the specific purpose for which it is used. All materials, devices, and equipment shall be approved by the VA. All materials and equipment shall be free from defect. All materials and equipment shall be new unless specifically indicated otherwise on the contract drawings.

1.6 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.

B. National Fire Protection Association (NFPA):

13-19 Installation of Sprinkler Systems

25-20 Inspection, Testing, and Maintenance of Water-Based Fire
Protection Systems

101-21 Life Safety Code

170-21 Fire Safety Symbols

C. Underwriters Laboratories, Inc. (UL):

Fire Protection Equipment Directory (2011)

D. Factory Mutual Engineering Corporation (FM):

Approval Guide

PART 2 - PRODUCTS

2.1 PIPING & FITTINGS

A. Piping and fittings for private underground water mains shall be in accordance with NFPA 13.

1. Pipe and fittings from inside face of building 300 mm (12 in.) above finished floor to a distance of approximately 1500 mm (5 ft.) outside building: Ductile Iron, flanged fittings and 316 stainless steel bolting.

B. Piping and fittings for sprinkler systems shall be in accordance with NFPA 13.

1. Plain-end pipe fittings with locking lugs or shear bolts are not permitted.
2. Piping sizes 50 mm (2 inches) and smaller shall be black steel Schedule 40 with threaded end connections.
3. Piping sizes 65 mm (2 ½ inches) and larger shall be black steel Schedule 10 with grooved connections. Grooves in Schedule 10 piping shall be rolled grooved only.
4. Use nonferrous piping in MRI Scanning Rooms.
5. Plastic piping shall not be permitted except for drain piping.
6. Flexible sprinkler hose shall be FM Approved and limited to hose with threaded end fittings with a minimum inside diameter of 1-inch and a maximum length of 6-feet.

2.2 VALVES

A. General:

1. Valves shall be in accordance with NFPA 13.
2. Do not use quarter turn ball valves for 50 mm (2 inch) or larger drain valves.
- B. Control Valve: The control valves shall be a listed indicating type. Control valves shall be UL Listed or FM Approved for fire protection installations. System control valve shall be rated for normal system pressure but in no case less than 175 PSI.
- C. Check Valve: Shall be of the swing type with a flanged cast iron body and flanged inspection plate.
- D. Automatic Ball Drips: Cast brass 20 mm (3/4 inch) in-line automatic ball drip with both ends threaded with iron pipe threads.
- E. Alarm Check Valve: Alarm check valve shall be UL Listed and Factory Mutual Approved. The alarm check valve shall be listed for installation in the vertical or horizontal position. The alarm check valve shall be equipped with a removable cover assembly, gauge connections on the system side and supply side of the valve clapper, variable pressure trim, and an external bypass to eliminate false water flow alarms. The alarm check valve trim piping shall be galvanized. Maximum water working pressure to 250 PSI.
- F. Backflow Preventer: Provide backflow preventer in accordance with Section 22 05 23, GENERAL-DUTY VALVES FOR PLUMBING PIPING. Provide means to forward flow test the backflow preventer in accordance with NFPA 13.

2.3 FIRE DEPARTMENT SIAMESE CONNECTION

- A. Brass, flush wall type, exterior fire department connection with brass escutcheon plate, without sill cock, and a minimum of two 65 mm (2-1/2 inch) connections threaded to match those on the local fire protection service, with polished brass caps and chains. Provide escutcheon with integral raised letters "Automatic Sprinkler". Install an automatic ball drip between fire department connection and check valve with drain piping routed to the exterior of the building or a floor drain.

2.4 SPRINKLERS

- A. All sprinklers shall be FM approved quick response except "institutional" type sprinklers shall be permitted to be UL Listed quick response. "Institutional" type sprinklers in Mental Health and Behavior Units shall be UL listed or FM approved quick response

type. Maximum break away strength shall be certified by the manufacturer to be no more than 39 kPa (85 pounds). Provide FM approved quick response sprinklers in all areas, except that standard response sprinklers shall be provided in freezers, refrigerators, elevator hoistways, elevator machine rooms, and generator rooms.

- B. Temperature Ratings: In accordance with NFPA 13 except that sprinklers in elevator shafts and elevator machine rooms shall be no less than intermediate temperature rated and sprinklers in generator rooms shall be no less than high temperature rated.
- C. Provide sprinkler guards in accordance with NFPA 13 and when the elevation of the sprinkler head is less than 7 feet 6 inches above finished floor. The sprinkler guard shall be UL listed or FM approved for use with the corresponding sprinkler.

2.5 SPRINKLER CABINET

- A. Provide sprinkler cabinet with the required number of sprinkler heads of all ratings and types installed, and a sprinkler wrench for each type of sprinkler in accordance with NFPA 13. Locate adjacent to the riser.
- B. Provide a list of sprinklers installed in the property in the cabinet. The list shall include the following:
 - 1. Manufacturer, model, orifice, deflector type, thermal sensitivity, and pressure for each type of sprinkler in the cabinet.
 - 2. General description of where each sprinkler is used.
 - 3. Quantity of each type present in the cabinet.
 - 4. Issue or revision date of list.

2.6 SPRINKLER SYSTEM SIGNAGE

- A Rigid plastic, steel or aluminum signs with white lettering on a red background with holes for easy attachment. Sprinkler system signage shall be attached to the valve or piping with chain.

2.7 SWITCHES:

- A. OS&Y Valve Supervisory Switches shall be in a weatherproof die cast/red baked enamel, oil resistant, aluminum housing with tamper resistant screws, 13 mm (1/2 inch) conduit

entrance and necessary facilities for attachment to the valves. Provide two SPDT switches rated at 2.5 amps at 24 VDC.

- B. Water flow Alarm Switches: Mechanical, non-coded, non-accumulative retard and adjustable from 0 to 60 seconds minimum. Set flow switches at an initial setting between 20 and 30 seconds.
- C. Alarm Pressure Switches: Activation by any flow of water equal to or in excess of the discharge from one sprinkler. The alarm pressure switch shall be UL Listed or Factory Mutual Approved for the application in which it is used. Activation of the alarm pressure switch shall cause an alarm on the fire alarm system control unit.
- D. Valve Supervisory Switches for Ball and Butterfly Valves: May be integral with the valve.

2.8 GAUGES

- A. Provide gauges as required by NFPA 13. Provide gauges where the normal pressure of the system is at the midrange of the gauge.

2.9 PIPE HANGERS, SUPPORTS AND RESTRAINT OF SYSTEM PIPING

- A. Pipe hangers, supports, and restraint of system piping shall be in accordance with NFPA 13.

2.10 WALL, FLOOR AND CEILING PLATES

- A. Provide chrome plated steel escutcheon plates.

2.11 ANTIFREEZE SOLUTION

- A. Antifreeze solution shall be in accordance with NFPA 13 and shall be compatible with use in a potable water supply.

2.12 VALVE TAGS

- A. Engraved black filled numbers and letters not less than 15 mm (1/2 inch) high for number designation, and not less than 8 mm (1/4 inch) for service designation on 19 gage, 40 mm (1-1/2 inches) round brass disc, attached with brass "S" hook, brass chain, or nylon twist tie.

2.13 EQUIPMENT AND MATERIALS IDENTIFICATION

- A. Use symbols, nomenclature and equipment numbers specified, shown in the drawings, or shown in the maintenance manuals. Refer to Section 09 51 00 for access

identification markers and Section 09 91 00 for identity marking and painting of systems to be accomplished by Mechanical Contractors Refer to Section 09 51 00 for access identification markers and Section 09 91 00 for identity markings and painting of systems to be accomplished by Fire Protection Contractors.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Installation shall be accomplished by the licensed contractor. Provide a qualified technician, experienced in the installation and operation of the type of system being installed, to supervise the installation and testing of the system.
- B. Installation of Piping: Accurately cut pipe to measurements established by the installer and work into place without springing or forcing. In any situation where bending of the pipe is required, use a standard pipe-bending template. Concealed piping in spaces that have finished ceilings. Where ceiling mounted equipment exists, such as in operating and radiology rooms, install sprinklers so as not to obstruct the movement or operation of the equipment. Sidewall heads may need to be utilized. In stairways, locate piping as near to the ceiling as possible to prevent tampering by unauthorized personnel and to provide a minimum headroom clearance of 2250 mm (seven feet six inches). Piping shall not obstruct the minimum means of egress clearances required by NFPA 101. Pipe hangers, supports, and restraint of system piping, and seismic bracing shall be installed accordance with NFPA 13.
- C. Welding: Conform to the requirements and recommendations of NFPA 13.
- D. Drains: Provide drips and drains, including low point drains, in accordance with NFPA 13. Pipe drains to discharge at safe points outside of the building or to sight cones attached to drains of adequate size to readily carry the full flow from each drain under maximum pressure. Do not provide a direct drain connection to sewer system or discharge into sinks. Install drips and drains where necessary and required by NFPA 13. The drain piping shall not be restricted or reduced and shall be of the same diameter as the drain collector.

- E. Supervisory Switches: Provide supervisory switches for sprinkler control valves.
- F. Waterflow Alarm Switches: Install waterflow alarm switches and valves in stairwells or other easily accessible locations.
- G. Inspector's Test Connection: Install and supply in accordance with NFPA 13, locate in a secured area, and discharge to the exterior of the building.
- H. Affix cutout disks, which are created by cutting holes in the walls of pipe for flow switches and non-threaded pipe connections to the respective waterflow switch or pipe connection near to the pipe from where they were cut.
- I. Provide escutcheon plates for exposed piping passing through walls, floors or ceilings.
- J. Clearances: For systems requiring seismic protection, piping that passes through floors or walls shall have penetrations sized 50 mm (2 inches) nominally larger than the penetrating pipe for pipe sizes 25 mm (1 inch) to 90 mm (3 ½ inches) and 100 mm (4 inches) nominally larger for penetrating pipe sizes 100 mm (4 inches) and larger.
- K. Sleeves: Provide for pipes passing through masonry or concrete. Provide space between the pipe and the sleeve in accordance with NFPA 13. Seal this space with a UL Listed through penetration fire stop material in accordance with Section 07 84 00, FIRESTOPPING. Where core drilling is used in lieu of sleeves, also seal space. Seal penetrations of walls, floors and ceilings of other types of construction, in accordance with Section 07 84 00, FIRESTOPPING.
- L. Where dry pendent sprinklers are used for freezers or similar spaces and they are connected to the wet pipe system, provide an EPDM boot around the dry pendent sprinkler on the heated side and securely seal to the pipe and freezer to prevent condensation from entering the freezer.
- M. Provide pressure gauges at each water flow alarm switch location and at each main drain connection.
- N. For each fire department connection, provide the symbolic sign given in NFPA 170 and locate 2400 to 3000 mm (8 to 10 feet) above each connection location. Size the sign to 450 by 450 mm (18 by 18 inches) with the symbol being at least 350 by 350 mm (14 by 14 inches).

- O. Firestopping shall be provided for all penetrations of fire resistance rated construction.

Firestopping shall comply with Section 07 84 00, FIRESTOPPING.

- P. MRI Suite: Provide no more than one penetration of the MRI shield enclosure.

- Q. Painting of Pipe: In finished areas where walls and ceilings have been painted, paint primed surfaces with two coats of paint to match adjacent surfaces, except paint valves and operating accessories with two coats of gloss red enamel. Exercise care to avoid painting sprinklers. Painting of sprinkler systems above suspended ceilings and in crawl spaces is not required. Painting shall comply with Section 09 91 00, PAINTING. Any painted sprinkler shall be replaced with a new sprinkler.

- R. Sprinkler System Signage: Provide rigid sprinkler system signage in accordance with NFPA 13 and NFPA 25. Sprinkler system signage shall include, but not limited to, the following:

1. Identification Signs:

- a. Provide signage for each control valve, drain valve, sprinkler cabinet, and inspector's test.
- b. Provide valve tags for each operable valve. Coordinate nomenclature and identification of operable valves with COR. Where existing nomenclature does not exist, the Tag Identification shall include no less than the following: (FP-B-F/SZ-#) Fire Protection, Building Number, Floor Number/Smoke Zone (if applicable), and Valve Number. (E.g., FP-500-1E-001) Fire Protection, Building 500, First Floor East, Number 001.)

2. Instruction/Information Signs:

- a. Provide signage for each control valve to indicate valve function and to indicate what system is being controlled.
- b. Provide signage indicating the number and location of low point drains.

3. Hydraulic Placards:

- a. Provide signage indicating hydraulic design information. The placard shall include location of the design area, discharge densities, required flow and residual pressure at the base of riser, occupancy classification, hose stream allowance,

flow test information, and installing contractor. Locate hydraulic placard information signs at each alarm check valve.

- S. Repairs: Repair damage to the building or equipment resulting from the installation of the sprinkler system by the installer at no additional expense to the Government.
- T. Interruption of Service: There shall be no interruption of the existing sprinkler protection, water, electric, or fire alarm services without prior permission of the Contracting Officer. Contractor shall develop an interim fire protection program where interruptions involve occupied spaces. Request in writing at least one week prior to the planned interruption.

3.2 INSPECTION AND TEST

- A. Preliminary Testing: Flush newly installed systems prior to performing hydrostatic tests in order to remove any debris which may have been left as well as ensuring piping is unobstructed. Hydrostatically test system, including the fire department connections, as specified in NFPA 13, in the presence of the Contracting Officers Representative (COR) or his designated representative. Test and flush underground water line prior to performing these hydrostatic tests.
- B. Final Inspection and Testing: Subject system to tests in accordance with NFPA 13, and when all necessary corrections have been accomplished, advise COR to schedule a final inspection and test. Connection to the fire alarm system shall have been in service for at least ten days prior to the final inspection, with adjustments made to prevent false alarms. Furnish all instruments, labor and materials required for the tests and provide the services of the installation foreman or other competent representative of the installer to perform the tests. Correct deficiencies and retest system as necessary, prior to the final acceptance. Include the operation of all features of the systems under normal operations in test.

3.3 INSTRUCTIONS

- A. Furnish the services of a competent instructor for not less than two hours for instructing personnel in the operation and maintenance of the system, on the dates requested by the COR.

CONSTRUCT PRIMARY CARE / MENTAL HEALTH BUILDING
BOISE VA MEDICAL CENTER - BOISE, ID

PROJECT #: 531-325
CONSTRUCTION DOCUMENTS

--- E N D ---