



**CITY OF AUSTIN
Austin Water**

**PROJECT MANUAL
Contract Documents and Technical Specifications**

**VOL. 3 of 6
Division 02 - 10**

CONFORMED

Wild Horse Ranch Wastewater Treatment Plant Expansion

C.I.P. PROJECT NUMBER: 7265.004 / IFB NUMBER: 6100 CLMC924

**CITY OF AUSTIN
Public Works Department
505 Barton Springs Rd. Ste. 800
Austin, TX 78704**

November 2022

CONFORMED DOCUMENTS

These Conformed Documents unify addenda issued during the bid period. If discrepancies between the Conformed Documents and the Bid Documents are found, the Bid Documents with the original addenda shall govern. Original sealed by Danny M. Hurtado, July 22, 2022, State of Texas PE No. 104266.



TBPELS No. F-882

The City of Austin is committed to compliance with the Americans with Disabilities Act. Reasonable modifications and equal access to communications will be provided upon request.

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CITY OF AUSTIN
Austin Water
Wild Horse Ranch Wastewater Treatment Plant Expansion
C.I.P. PROJECT NUMBER: 7265.004 / IFB NUMBER: 6100 CLMC924

Original sealed by
Danny M. Hurtado,
June 17, 2022,
TX PE No. 104266.

CIVIL/MECHANICAL

SECTION NUMBERS:

DIVISION 00	11366B	15117
DIVISION 01	11375	15118
SERIES 100	11377A	15119
SERIES 200	11378A	15120
SERIES 300	11395A	15121
SERIES 500	11635	15244
SERIES 600	13120	15259
SERIES 700	13446	15278
802S	13447	15286
SP130S	14650	15293
06608	15050	15956
08332	15052	15958
09960	15061	17101
11289	15075	17302
11294C	15076	17305
11305	15110	17404
11312D	15111	17502
11312J	15112	17506
11312X	15115	17522
11317	15116	



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CITY OF AUSTIN
Austin Water
Wild Horse Ranch Wastewater Treatment Plant Expansion
C.I.P. PROJECT NUMBER: 7265.004 / IFB NUMBER: 6100 CLMC924

Original sealed by
Kwasi Duose,
June 17, 2022,
TX PE No. 100650.

STRUCTURAL

SECTION NUMBERS:

SERIES 400	03055
SP401S	03072
SP403S	03600
SP405S	04055
SP406S	05140
SP408S	05190
SP410S	05310
SP411S	05500
SP416S	13122
SP510	
SP511	
SP720S	
SP721S	



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CITY OF AUSTIN
Austin Water
Wild Horse Ranch Wastewater Treatment Plant Expansion
C.I.P. PROJECT NUMBER: 7265.004 / IFB NUMBER: 6100 CLMC924

Original sealed by
Chad Green,
February 28, 2022,
TX PE No. 119980.

HVAC

SECTION NUMBERS:

10910	15812
15082	15814
15084	15815
15282	15820
15294	15830
15400	15936
15430	15954
15735	
15740	
15762	



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Austin Water
Wild Horse Ranch Wastewater Treatment Plant Expansion
C.I.P. PROJECT NUMBER: 7265.004 / IFB NUMBER: 6100 CLMC924

Original sealed by
Jonathan P. Herrboldt,
February 28, 2022,
TX PE No. 135057.

MECHANICAL

SECTION NUMBERS:

11312R
11355A
11376A



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CITY OF AUSTIN
Austin Water
Wild Horse Ranch Wastewater Treatment Plant Expansion

C.I.P. PROJECT NUMBER: 7265.004 / IFB NUMBER: 6100 CLMC924

Original sealed by
Casey G. Wauters,
February 28, 2022,
TX PE No. 93889.

CIVIL/MECHANICAL

RESPONSIBLE SPECIFICATION SECTIONS:

03160	11313	11333
09800	11323	11353
11312C	11324	14555
11312F	11327	



AECOM Technical Services, Inc.
13640 Briarwick Drive, Suite 200
Austin, Texas, 78729
TBPE REG. No. F-3580

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CITY OF AUSTIN
Austin Water
Wild Horse Ranch Wastewater Treatment Plant Expansion

C.I.P. PROJECT NUMBER: 7265.004 / IFB NUMBER: 6100 CLMC924

Original sealed by
Stephanie D. Blew,
February 28, 2022,
TX PE No. 92682.

CIVIL

RESPONSIBLE SPECIFICATION SECTIONS:

15114 CHECK VALES (DUCK BILL)
SP436S P.C. CONCRETE VALLEY GUTTERS



TBPE REG. NO. F-003572

7908 CAMERON ROAD, AUSTIN, TX 78754; (512) 836-2388

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CITY OF AUSTIN
Austin Water
Wild Horse Ranch Wastewater Treatment Plant Expansion

C.I.P. PROJECT NUMBER: 7265.004 / IFB NUMBER: 6100 CLMC924

Original sealed by
K.A. Harutunian,
February 28, 2022,
TX PE No. 59181.

Original sealed by
Anne H. Harutunian,
February 28, 2022, TX
PE No. 11571.

Original sealed by
Shant Harutunian,
February 28, 2022,
TX PE No. 87735.

ELECTRICAL, INSTRUMENTATION AND CONTROL

RESPONSIBLE SPECIFICATION SECTIONS:

13390	16450
13851	16483
16120	16500
16121	16524
16130	16540
16140	16550
16150	16600
16200	16800
16205	17100
16222	17200
16264	17380
16300	17600
16350	SP16150
16444	SP16200



HARUTUNIAN ENGINEERING INCORPORATED (HEI)
Engineering and Environmental Consultants
8100 Cross Park Drive
Austin, Texas 78754
(512) 454-2788 FAX (512) 454-6434
TBPE Firm Registration No. F-2408

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CITY OF AUSTIN
Austin Water
Wild Horse Ranch Wastewater Treatment Plant Expansion

C.I.P. PROJECT NUMBER: 7265.004 / IFB NUMBER: 6100 CLMC924

Original sealed by
Linda L. Barlow,
February 24, 2022,
TX PE No. 63878.

TRAFFIC CONTROL PLAN DESIGN

RESPONSIBLE SPECIFICATION SECTIONS:

803S BARRICADES, SIGNS AND TRAFFIC HANDLING



TBPELS # f-646
1701 DIRECTORS BLVD, SUITE 900
AUSTIN, TEXAS 78744

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CITY OF AUSTIN
Austin Water
Wild Horse Ranch Wastewater Treatment Plant Expansion

C.I.P. PROJECT NUMBER: 7265.004 / IFB NUMBER: 6100 CLMC924

Original sealed by
David Negrete,
February 28, 2022,
TX PE No. 11640.

Architect

RESPONSIBLE SPECIFICATION SECTIONS:

02360	07212	08210	09902
02870	07213	08330	10100
03350	07214	08410	10400
03550	07301	08710	10500
04220	07415	08800	10520
06100	07468	09260	10615
06410	07600	09310	10810
07110	07714	09511	11400
07160	07900	09650	12486
07210	08110	09670	12494

NEGRETE & KOLAR
ARCHITECTS,LLP

www.nekoarch.com

11720 North IH 35, Austin, TX 78753

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Document Number	Date	Title
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VOLUME 1

	06/27/2022	Table of Contents
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BIDDING REQUIREMENTS, CONTRACT FORMS, & CONDITIONS OF THE CONTRACT

00020	09/21/2021	Invitation for Bids ^{AD3, AD4}
00100	05/06/2022	Instructions to Bidders
00220	03/30/2018	Geotechnical Data
00300L	09/01/2021	Bid Form-Lump Sum ^{AD3}
	04/03/2020	Total Bid Form
00400	04/30/2019	Statement of Bidder's Experience
00405	03/30/2018	Certificate of Non-Suspension or Debarment
00410	09/17/2018	Statement of Bidder's Safety Experience
00425A	08/12/2019	Insurance Cost Form
00425B	08/12/2019	Rolling Owner controlled Insurance Program Information
00440	09/02/2021	Prohibited Activities
00500	02/04/2020	Agreement (SAMPLE)
00610	02/04/2020	Performance Bond
00620	02/04/2020	Payment Bond
00630	10/22/2019	Non-Discrimination and Non-Retaliation Certificate
00631	03/30/2018	Title VI Assurances Appendix A
00632	03/30/2018	Title VI Assurances Appendix E
00650	06/08/2018	Certificate of Insurance
00670	01/11/2019	Texas Sales and Use Tax Exemption Certificate
00680	03/30/2018	Non-Use of Asbestos Affidavit (Contractor Prior to Construction)
00681	03/30/2018	Non-Use of Asbestos Affidavit (Contractor After Construction)
00700	12/04/2020	General Conditions of the Contract
00810	05/06/2022	Supplemental General Conditions
00819	06/10/2005	Security Requirements
00820	05/06/2022	Modifications to Bidding Requirements and Contract Forms
00830	09/05/2022	Wage Rates and Payroll Reporting ^{AD5}
00830BC	09/05/2022	Wage Rates and Payroll Reporting (Building Construction Type) ^{AD5}
00830HH	09/05/2022	Wage Rates and Payroll Reporting (Heavy Highway) ^{AD5}
00840	09/01/2021	Construction Training Program Requirements
00900	05/10/2021	Addendum (SAMPLE)

SPECIFICATIONS**Division 1 – General Requirements**

01010	08/28/2020	Summary of Work
01020	03/30/2018	Allowances ^{AD3}
01025	09/17/2018	Measurement and Payment Lump Sum Contracts
01030	03/30/2018	Alternates
01045	02/28/2022	Cutting and Patching
01050	10/19/2015	Grades Lines and Levels
SP-1070	05/12/2021	Facility Security Procedures for Contractors
01095	07/21/2003	Reference Standards and Definitions
01096	05/06/2011	Stormwater Pollution Prevention Plan (SWPPP)
01140	02/28/2022	Work Restrictions ^{AD5}
01200	05/06/2022	Project Meetings
01300	05/06/2022	Submittals
01310	02/28/2022	Schedules and Reports
01322	02/28/2022	Web Based Construction Document Management
01352	06/29/2018	Sustainable Construction Requirements
01353	04/29/2020	Construction Equipment Emissions Reduction Plan
01380	08/09/2012	Construction Photography & Videos
01400	02/28/2022	Quality Control Services
01410	02/28/2022	Regulatory Requirements
01455	02/28/2022	Regulatory Quality Assurance
01500	08/28/2020	Temporary Facilities
01505	08/12/2019	Construction and Demolition Waste Management
01550	08/09/2012	Public Safety and Convenience
01600	02/28/2022	Product Requirements
01610	02/28/2022	Project Design Criteria
01612	02/28/2022	Seismic Design Criteria
01614	02/28/2022	Wind Design Criteria
01700	02/28/2022	Contract Closeout
01730	02/28/2022	Operation and Maintenance Manuals
01738	02/28/2022	Selective Alterations and Demolition
01756	02/28/2022	Commissioning ^{AD2, AD3}
01757	02/28/2022	Disinfection
01759	02/28/2022	Water Leakage Test for Concrete Structures
01783	02/28/2022	Warranties and Bonds
01900	03/12/2012	Prohibition of Asbestos Containing Materials
01900a	06/05/2006	Statement of Non-Inclusion of Asbestos Containing Material (E/A Prior to Design)
01900b	06/05/2006	Statement of Non-Inclusion of Asbestos Containing Material (E/A After Design)

VOLUME 2**City Standard Technical Specifications****Series 100 – Earthwork**

101s	03/25/2021	Preparing Right of Way
102s	03/25/2021	Clearing and Grubbing
104s	09/26/2012	Removing Portland Cement Concrete
111s	09/26/2012	Excavation
130s	09/26/2012	Borrow
132s	08/20/2007	Embankment

Series 200 – Subgrade and Base Construction

201S	06/17/2021	Subgrade Preparation
202S	06/17/2021	Hydrated Lime and Lime Slurry
203S	09/14/2021	Lime Treatment for Materials in Place
204S	09/26/2012	Portland Cement Treatment for Materials in Place
210S	02/24/2010	Flexible Base
220S	02/24/2010	Sprinkling for Dust Control
230S	08/20/2007	Rolling (Flat Wheel)
232S	08/20/2007	Rolling (Pneumatic Tire)
234S	08/20/2007	Rolling (Tamping)
236S	08/20/2007	Proof Rolling

Series 300 – Street Surface Courses

301S	08/20/2007	Asphalts, Oils and Emulsions
306S	02/24/2010	Prime Coat
307S	02/24/2010	Tack Coat
312S	09/26/2012	Seal Coat
313S	02/24/2010	Cleaning and/or Sealing Joints and Cracks (Asphaltic Concrete)
340S	09/26/2012	Hot Mix Asphaltic Concrete Pavement
360S	09/26/2012	Concrete Pavement

Series 400 – Concrete Structures and Miscellaneous Concrete

401S	09/26/2012	Structural Excavation and Backfill
402S	11/13/2007	Controlled Low Strength Material
403S	09/26/2012	Concrete for Structures
405S	11/13/2007	Concrete Admixtures
406S	09/26/2012	Reinforcing Steel
408S	11/13/2007	Concrete Joint Materials
409S	11/13/2007	Membrane Curing
410S	09/14/2021	Concrete Structures
411S	11/13/2007	Surface Finishes for Concrete
414S	11/13/2007	Concrete Retaining Walls
416S	11/13/2007	Waterstops
430S	11/15/2011	P.C. Concrete Curb and Gutter
432S	01/04/2010	Portland Cement Concrete Sidewalks
433S	12/09/2008	P. C. Concrete Driveways
436S	11/13/2007	P.C. Concrete Valley Gutters
439S	11/13/2007	Parking Lot Bumper Curbs

Series 500 – Pipe and Appurtenances

501S	09/26/2012	Jacking or Boring Pipe
503S	02/17/2000	Frames, Grates, Rings, and Covers
504S	02/24/2010	Adjusting Structures
505S	02/24/2010	Concrete Encasement and Encasement Pipe
506	02/22/2021	Manholes
508S	02/24/2010	Miscellaneous Structures and Appurtenances
509S	09/26/2012	Excavation Safety Systems
510	12/08/2018	Pipe
511	02/14/2022	Water Valves
551	12/15/2021	Pipe Underdrains

591S	01/04/2016	Riprap for Slope Protection
594S	09/26/2012	Gabions and Revet Mattresses

Series 600 – Environmental Enhancements

601S	11/14/2016	Salvaging and Placing Topsoil
604S	06/17/2021	Seeding for Erosion Control
605S	06/21/2007	Soil Retention Blanket
606S	06/21/2007	Fertilizer
609S	01/04/2016	Native Grassland Seeding and Planting for Erosion Control
610S	12/07/2018	Preservation of Trees and Other Vegetation
620S	01/04/2016	Filter Fabric
627S	09/26/2012	Grass-Lined Swale
639S	08/18/2010	Rock Berm
641S	06/21/2007	Stabilized Construction Entrance
642S	09/01/2011	Silt Fence
648S	08/18/2010	Mulch Sock

Series 700 – Incidental Construction

700S	09/26/2012	Mobilization
701S	09/26/2012	Fencing
702S	05/20/2002	Removal and Relocation of Existing Fences
720S	09/26/2012	Metal for Structures
721S	09/26/2012	Steel Structures

Series 800 – Urban Transportation

802s	09/14/2021	Project Signs
803s	11/15/2011	Barricades, Signs and Traffic Handling

Special Provisions to City Standard Technical Specifications

SP130s	02/28/2022	Special Provision – Borrow
SP401S	02/28/2022	Special Provision – Structural Excavation and Backfill
SP403S	02/28/2022	Special Provision – Concrete for Structures
SP405S	02/28/2022	Special Provision – Concrete Admixtures
SP406S	02/28/2022	Special Provision – Reinforcing Steel
SP408S	02/28/2022	Special Provision – Concrete Joint Materials
SP410S	06/15/2022	Special Provision – Concrete Structures
SP411S	02/28/2022	Special Provision – Surface Finishes for Concrete
SP416S	02/28/2022	Special Provision – Waterstops
SP436S	02/28/2022	Special Provision – P.C. Concrete Valley Gutters
SP510	06/15/2022	Special Provision – Pipe
SP511	02/28/2022	Special Provision – Water Valves
SP720S	02/28/2022	Special Provision – Metal for Structures
SP721S	02/28/2022	Special Provision – Steel Structures

VOLUME 3

DIVISION 02 – SITE CONSTRUCTION

02360	02/28/2022	Termite Control
02870	02/28/2022	Site Furnishings

DIVISION 03 – CONCRETE

03055	02/28/2022	Adhesive-Bonded Reinforcing Bars and All Thread Rods in Concrete
03072	02/28/2022	Epoxy Resin/Portland Cement Bonding Agent
03160	07/07/2021	Steel Sheet Piling ^{AD5}
03350	02/28/2022	Concrete Finishing
03550	02/28/2022	Polished Concrete Finishing
03600	02/28/2022	Grouting

DIVISION 04 – MASONRY

04055	02/28/2022	Adhesive Bonding Reinforcing Bars and All Thread Rods in Masonry
04220	02/28/2022	Concrete Masonry Units

DIVISION 05 – METALS

05140	02/28/2022	Structural Aluminum
05190	02/28/2022	Mechanical Anchoring and Fastening To Concrete And Masonry
05219	02/28/2022	Steel Truss
05310	02/28/2022	Steel Decking
05500	02/28/2022	Metal Fabrications

DIVISION 06 -WOOD AND PLASTICS

06100	02/28/2022	Rough Carpentry
06410	02/28/2022	Custom Casework
06608	02/28/2022	Fiberglass Reinforced Plastic

DIVISION 07 – THERMAL AND MOISTURE PROTECTION

07110	02/28/2022	Dampproofing
07131	02/28/2022	Sheet Moisture Barrier
07160	02/28/2022	Sheet Vapor Retarders
07210	02/28/2022	Pre-Engineered Building Insulation
07212	02/28/2022	Board Insulation
07213	02/28/2022	Batt Insulation
07214	02/28/2022	Foamed-in-Place Insulation
07301	02/28/2022	Roof Underlayment
07415	02/28/2022	Metal Roofing
07468	02/28/2022	Metal Siding
07600	02/28/2022	Flashing and Sheet Metal
07714	02/28/2022	Gutters and Downspouts
07900	02/28/2022	Joint Sealers

DIVISION 08 – DOORS AND WINDOWS

08110	02/28/2022	Steel Doors and Frames
08210	02/28/2022	Wood Doors
08330	02/28/2022	Architectural Overhead Coiling Door
08332	02/28/2022	Motorized Overhead Coiling Door
08410	02/28/2022	Metal Framed Storefront
08710	02/28/2022	Door Hardware
08800	02/28/2022	Glazing

DIVISION 09 – FINISHES

09260	02/28/2022	Gypsum Board Assemblies
09310	02/28/2022	Ceramic Tile
09511	02/28/2022	Acoustical Ceiling Panels
09650	02/28/2022	Resilient Flooring
09670	02/28/2022	Fluid-Applied Flooring
09800	07/07/2021	Sheet Piling Coating
09902	02/28/2022	Painting
09960	06/15/2022	High-Performance Coatings

DIVISION 10 – SPECIALTIES

10100	02/28/2022	Visual Display Boards
10400	02/28/2022	Signage
10500	02/28/2022	Lockers
10520	02/28/2022	Fire Protection Specialties
10615	02/28/2022	Demountable Partitions
10810	02/28/2022	Toilet Accessories
10910	02/28/2022	Louvers

VOLUME 4

DIVISION 11 – EQUIPMENT

11289	02/28/2022	Ultraviolet Disinfection System ^{AD3}
11294C	02/28/2022	Fabricated Stainless Steel Slide Gates ^{AD2}
11305	09/02/2016	Submersible Non-Clog Sewage Pumps [this is a City Master but modified by Carollo] ^{AD2}
11312C	07/07/2021	Prerotation Submersible Pumps
11312D	02/28/2022	Vertical Turbine Short Setting Centrifugal Pumps ^{AD2}
11312F	07/07/2021	Sewage Pumps, Self-Priming, Volute-Mounted
11312J	02/28/2022	Submersible Process Liquid Sump Pumps
11312R	02/28/2022	Single-Lobe Rotary Pumps
11312X	02/28/2022	Horizontal Propeller Pump ^{AD5}
11313	07/07/2021	Magnetic Coupling Variable Speed Control System for Return Activated Sludge Pumps
11317	02/28/2022	Submersible Mixers: High-Speed ^{AD5}
11323	07/07/2021	Vortex Grit Chamber Equipment ^{AD5}
11324	07/07/2021	Grit Washer
11327	07/07/2021	Multi-Rake Screens
11333	07/07/2021	Screenings Washer Compactor
11353	11/23/2021	Circular Secondary Clarifier Equipment Column Supported, Spiral Blade Type
11355A	02/28/2022	Volute Thickener ^{AD3}
11366B	02/28/2022	Cloth Media Filters ^{AD3}
11375	02/28/2022	Single Stage Centrifugal Air Blowers ^{AD5}
11376A	02/28/2022	Rotary-Lobe Blowers ^{AD2}
11377A	02/28/2022	Coarse Bubble Diffusers
11378A	02/28/2022	Fine Bubble Diffused Aeration System – Disk ^{AD2}
11395A	02/28/2022	Pre-Engineered Single-Stage Biotrickling Filter Odor Control Systems
11400	02/28/2022	Kitchen Appliances
11635	02/28/2022	Automatic Samplers

DIVISION 12 – FURNISHINGS

12486	02/28/2022	Floor Mats
12494	02/28/2022	Roller Shades

DIVISION 13 – SPECIAL CONSTRUCTION

13120	02/28/2022	Fiberglass Effluent Troughs
13122	02/28/2022	Metal Building System
13390	02/28/2022	Packaged Control Systems
13446	02/28/2022	Manual Actuators
13447	02/28/2022	Electric Actuators
13851	02/28/2022	Fire Alarm Systems

DIVISION 14 – CONVEYING SYSTEMS

14555	07/07/2021	Shaftless Screw Conveyor and Appurtenances
14650	02/28/2022	Jib Cranes

DIVISION 15 – MECHANICAL

15050	02/28/2022	Common Work Results For Mechanical Equipment
15052	02/28/2022	Common Work Results For General Piping
15061	02/28/2022	Pipe Supports
15075	02/28/2022	Equipment Identification
15076	02/28/2022	Pipe Identification
15082	02/28/2022	Piping Insulation
15084	02/28/2022	Ductwork Insulation
15110	02/28/2022	Common Work Results For Valves ^{AD3}
15111	02/28/2022	Ball Valves
15112	06/15/2022	Butterfly Valves ^{AD3}
15114	02/28/2022	Check Valves ^{AD3}
15115	02/28/2022	Gate, Globe, and Angle Valves
15116	06/15/2022	Plug Valves
15117	02/28/2022	Specialty Valves
15118	02/28/2022	Pressure Reducing and Pressure Relief Valves
15119	02/28/2022	Air and Vacuum Relief Valves
15120	02/28/2022	Piping Specialties
15121	02/28/2022	Pipe Couplings
15244	02/28/2022	Polyvinyl Chloride (PVC) Pipe: AWWA C900
15259	02/28/2022	Chlorinated Polyvinyl Chloride (CPVC) Pipe: ASTM F441
15278	02/28/2022	Steel Pipe: Exposed
15282	02/28/2022	Copper Tube: Seamless, ASTM B280
15286	02/28/2022	Stainless Steel Pipe and Tubing
15293	02/28/2022	Double Containment Piping
15294	02/28/2022	Rubber Hose
15400	02/28/2022	Plumbing Systems
15430	02/28/2022	Emergency Eye/Face Wash and Shower Equipment
15735	02/28/2022	Positive Pressurization Equipment
15740	02/28/2022	Heat Pumps
15762	02/28/2022	Heating Units
15812	02/28/2022	Metal Ducts
15814	02/28/2022	Fiberglass Reinforced Plastic Ducts
15815	02/28/2022	Flexible Ducts
15820	02/28/2022	Ductwork Accessories
15830	02/28/2022	Fans ^{AD6}
15936	02/28/2022	Instrumentation and Control Devices for HVAC

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15954	02/28/2022	Testing, Adjusting, and Balancing for HVAC
15956	02/28/2022	Piping Systems Testing
15958	02/28/2022	Mechanical Equipment Testing

DIVISION 16 – ELECTRICAL

16120	02/28/2022	480 Volt Motor Control Centers
16121	02/28/2022	Modifications to Existing 480 Volt Motor Control Centers
16130	09/30/2015	Boxes and Cabinets
16140	02/28/2022	Switchboards
16150	09/24/2019	Raceways, Fittings and Supports
SP16150	02/28/2022	Special Provision – Raceways, Fittings and Supports
16200	09/30/2015	Wiring, Conductors and Cables (600 Volts and Below)
SP16200	02/28/2022	Special Provision – Wiring, Conductors and Cables (600 Volts and Below)
16205	09/30/2015	Wire and Cable Tagging
16222	02/28/2022	Electric Motors, Induction, 600V and Below
16264	02/28/2022	208/120 Volt Uninterruptible Power Supply
16300	02/28/2022	Wiring Devices
16350	02/28/2022	Lighting
16444	02/28/2022	Combination Motor Starter
16450	02/28/2022	600 Volts and Below Dry Type Transformers
16483	02/28/2022	480 Volt Variable Frequency Drive
16500	02/28/2022	Panelboards
16524	02/28/2022	480 Volt Automatic Transfer Switches
16540	02/28/2022	Field Control Stations
16550	02/28/2022	Grounding
16600	02/28/2022	Disconnect Switches and Enclosed Circuit Breakers
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DIVISION 17 – INSTRUMENTATION AND CONTROL

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END

SECTION 02360

TERMITE CONTROL

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Stainless steel mesh barrier for termite control below and above grade at penetrations of all interior and the exterior foundation perimeter of new construction, as indicated in the drawings.
- B. Related Sections:
 - 1. Section 360S – Concrete Pavement.
 - 2. Section 410S – Concrete Structures.
 - 3. Section 01600 – Product Requirements: Substitution procedures.
 - 4. Section 04220 – Concrete Masonry Units.
 - 5. Section 06100 – Rough Carpentry: Wood framing.

1.02 REFERENCES

- A. National Pest Management Association:
 - 1. ICC – International Code Congress.
 - 2. NPMA WDO – Wood Destroying Organism Library.

1.03 SUBMITTALS

- A. Section 01300 – Submittals: Requirements for submittals.
- B. Product Data:
 - 1. Stainless Steel Mesh:
 - a. Submit manufacturer's data on stainless steel mesh and accessories.
 - b. Governing ICC ES Report for product to be installed.
 - c. Shop Drawings:
 - 1) Submit scaled shop drawings prepared specifically for Project to illustrate details, dimensions, and other data necessary to fully describe installation of termite control.
 - 2) Provide details of each proposed assembly identifying intended products and other similar information.
 - 3) Show adjacent or related portions of Work coordinated in a complete manner.
 - 4) Coordinate Shop Drawings submittal with submittals for related parts of works, including:
 - a) Section 360S – Concrete Pavement.
 - b) Section 410S – Concrete Structures.
 - c) Section 04220 – Concrete Masonry Units.
 - d) Section 06100 – Rough Carpentry.
- C. Test Reports: Indicate regulatory agency approval reports.

- D. Manufacturer's Application Instructions:
 - 1. Manufacturer's instructions for installation/application. Include Manufacturer's storage and handling requirements, site preparation and care, cleaning instructions, and other recommendations.
- E. Manufacturer's Certificate:
 - 1. Certify products furnished comply with requirements.
- F. Installer's Certificate:
 - 1. Certify installer/applicator is licensed for termite control at the project location.
 - 2. Certify installer/applicator is trained and approved by manufacturer with not less than 5 completed projects similar in scope and complexity to the project requirements. Submit list of complete projects of similar scope and complexity.
- G. Warranty: Submit sample warranty.

1.04 CLOSEOUT SUBMITTALS

- A. Section 01700 - Contract Closeout: Requirements for submittals.
- B. Project Record Documents: Include record document.
- C. Warranty: Submit warranty dated to commence upon Substantial Completion of the project.

1.05 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.
- B. Installer: Company specializing in performing the Work of this section with minimum 3 years documented experience, trained and approved by manufacturer with a minimum of 5 completed projects of similar size and scope to the requirements of this project. Installer shall have not less than a Level 3 accreditation.

1.06 SEQUENCING

- A. Section 01010 - Summary: Work sequence.
- B. Sequence installation with following in order to maintain integrity of each component:
 - 1. Expansion joints: Install stainless steel mesh barrier.
 - 2. Electrical, plumbing and HVAC equipment, conduit and piping: Install stainless steel mesh barrier.
 - 3. Under-slab moisture.
 - 4. Reinforcing steel.

1.07 PRE-INSTALLATION MEETINGS

- A. Section 01400 – Quality Control Services: Pre-installation meeting.

- B. Convene minimum two weeks prior to commencing work of this section.
- C. Required attendees: OWNER, Architect, Structural Engineer, General Contractor, sub-contractor installing concrete, mechanical, plumbing, and electrical installers, and installer of the work of this section.

1.08 WARRANTY

- A. Section 01700 - Contract Closeout: Requirements for warranties.
- B. Furnish ten year warranty. Manufacturer to certify that stainless steel mesh will prevent infestation of subterranean and Formosan termites.
- C. Warranty: Include coverage for damage and repairs to building and building contents caused by termites. Repair damage. Re-treat where required.
- D. Inspect and report annually, during warranty period, to OWNER in writing.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Stainless Steel Mesh Barrier System:
 - 1. Manufacturer:
 - a. Termi-mesh manufactured by Termimesh, LL.
 - b. Substitutions: Section 01600 - Product Requirements.
 - 2. Stainless Steel mesh:
 - a. Product: Termi-Mesh, Termistop Wire Diameter: 0.08 in.
 - b. Marine Grade, Type 725.
 - c. Mesh Size: 0.025 x 0.018 inches.
 - 3. Accessories:
 - a. Stainless Steel Clamps: As recommended by stainless steel mesh barrier manufacturer.
 - b. Parging Compound: Specialized bonding cement as recommended by stainless steel mesh barrier manufacturer.
 - c. Bonding Cement: As recommended by stainless steel mesh manufacturer.
- B. Design Criteria:
 - 1. Place Mesh barrier across openings, joints, penetrations, and other termite entry points to building. Clamp, parge adhere, bond and/or embed mesh to surface surrounding opening. Metal mesh barrier shall be provided at, but not limited to, the following locations:
 - a. Penetrations through ground floor slabs/foundations.
 - b. Expansion and control joints on ground floor slabs and foundations: Saw cut joints do not require treatment unless deeper than 1/4-inch in depth.
 - c. Perimeter exterior masonry adjacent to grade.
 - d. Perimeter footings to adjacent concrete flatwork.
 - e. Other areas determined by Manufacturer's representative to be hidden entry for termites.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Section 01200 – Project Meetings: Verification of existing conditions before starting work.
- B. Verify final grading and excavation are complete.
- C. Examine substrates, areas, and conditions under which application of termite control shall be performed.
 - 1. Examine interface with earthwork, slab and foundation work, landscaping, and other conditions affecting performance of termite control. Do not proceed until unsatisfactory conditions have been corrected. Commencement of installation constitutes acceptance of conditions and responsibility for satisfactory performance.

3.02 PREPARATION

- A. General Requirements:
 - 1. Remove extraneous sources of wood cellulose and other termite edible materials such as wood debris, tree stumps and roots, stakes, formwork, and construction waste wood from soil within and around foundations/slabs.

3.03 INSTALLATION

- A. Install mesh barrier system in compliance with Manufacturer's written instructions in a manner that will prevent termite penetration of slab and below grade walls where future construction is indicated.
- B. Place metal mesh barrier where indicated on shop drawings to provide a continuous barrier to entry of subterranean termites.
- C. Fit mesh tightly around pipe or other penetrations, and terminate at slab and foundation perimeters.
- D. Install mesh under perimeter of concrete slab edges and joints after vapor barrier and reinforcing steel are in place, and comply with Manufacturer's written installation methods.
- E. Apply corrosion resistant material to steel reinforcing to prevent direct contact with metal mesh.
- F. Install mesh, clamps, and parging compound to provide permanent installation capable of preventing termite entry above slab at locations indicate Provide barrier within slab thickness where possible.
- G. Install mesh with no gaps, penetrations, or damage.
- H. Apply Manufacturer provided identification tape above concrete level to mark barrier locations.

3.04 PROTECTION OF FINISHED WORK

- A. Section 01700 - Contract Closeout: Protecting finished Work.
- B. Protect installed mesh termite control system, attachments, and accessories before, during, and after work of other trades. In the event other trades, following installation of mesh, move or damage mesh, clamps, or parging mix, immediately contact mesh installer for recommendation of necessary repairs.

3.05 SCHEDULE

- A. Termite Control Barrier shall be provided for the following buildings:
 - 1. Administration Building.
 - 2. Electrical Substation.

END OF SECTION

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SECTION 02870
SITE FURNISHINGS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Administration Building requirements:
 - 1. Stainless steel litter and recycling receptacles.

1.02 SUBMITTALS

- A. Section 01300 – Submittals: Requirements for submittals.
- B. Product Data:
 - 1. Manufacturer's standard product literature.
 - 2. Shop drawings.
 - 3. Installation instructions.
 - 4. Maintenance instructions.
- C. Samples:
 - 1. Selection Samples: Provide samples representing manufacturer's full range of available peel and stick vinyl stickers for receptacle designations.

1.03 Quality Assurance

- A. Manufacturer Qualifications
 - 1. Minimum 15 years experience in the manufacture of litter and recycling receptacles.
 - 2. Provide reference list of at least ten major transportation authorities, municipalities, universities or other high-use public environments currently using litter and recycling receptacles fabricated by the manufacturer.

1.04 Delivery, Storage and Handling

- A. Handle products in accordance with manufacturer's instructions.
- B. Store products in manufacturer's original packaging until ready for installation.
- C. Protect products from impacts and abrasion during storage.

1.05 Warranty

- A. Provide manufacturer's standard warranty.
 - 1. Warranty terms: one year from date of invoice against defects in materials and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Basis of design: provide receptacles based on the product named:
 - 1. Step-On Containers, model number FGST24SSPL.
8900 Northpointe Executive Drive, Huntersville, NC 28078
Phone: 1-800-347-9800
website: <https://www.rubbermaidcommercial.com/>

- B. Receptacles
 - 1. Materials:
 - a. Structural frame:
 - 1) Base and top castings: solid corrosion-resistant stainless steel.
 - 2) Vertical supports: stainless steel.
 - b. Body and Lid: stainless steel.
 - c. Liner: leak-proof rigid plastic.
 - 2. Finish of materials:
 - a. Satin.
 - 3. Dimensions:
 - a. 24 gallon, top opening with one 24 gallon liner: 15" wide x 15" deep x 30" high
 - 4. Instructional Graphics:
 - a. Apply instructional graphics to lids and front as specified to indicate the intended waste or recycling stream.
 - 1) "TRASH ONLY" peel and stick vinyl label, 6" square minimum.
 - 2) "RECYCLABLE ONLY" peel and stick vinyl label, 6" square minimum.
 - 5. Installation:
 - a. Freestanding.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrates are stable and capable of supporting the weight of items covered under this section.

3.02 PREPARATION

- A. Clean and vacuum surfaces thoroughly prior to installation.

3.03 INSTALLATION

- A. Install according to the manufacturer's installation instructions.

3.04 SCHEDULE

- A. Break Room (104):
 - 1. Two (2) receptacles (one for trash, one for recyclables).

END OF SECTION

SECTION 03055

ADHESIVE-BONDED REINFORCING BARS AND ALL THREAD RODS IN CONCRETE

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Bonding reinforcing bars and all thread rods in concrete using adhesives.

1.02 REFERENCES

- A. American Concrete Institute (ACI).
 - 1. 355.4 - Qualification of Post-Installed Adhesive Anchors in Concrete and Commentary.
- B. American National Standards Institute (ANSI):
 - 1. Standard B212.15 - Carbide Tipped Masonry Drills and Blanks for Carbide Tipped Masonry Drills.
- C. ASTM international (ASTM):
 - 1. C881 - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.
- D. Concrete Reinforcing Steel Institute (CRSI).
- E. ICC Evaluation Service, Inc. (ICC-ES):
 - 1. AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements.
- F. Society for Protective Coatings (SSPC):
 - 1. SP-1 - Solvent Cleaning.

1.03 DEFINITIONS

- A. Evaluation Service Report (ESR): Report prepared by ICC-ES, or other testing agency acceptable to Engineer and to the Building Official, that documents testing and review of a product to confirm that it complies with the requirements of designated ICC-ES Acceptance Criteria, and to document its acceptance for use under the Building Code specified in Section 01410 - Regulatory Requirements.

1.04 SUBMITTALS

- A. Product data: Technical data for adhesives, including:
 - 1. Manufacturer's printed installation instructions (MPII).
 - 2. Independent laboratory test results indicating allowable loads in tension and shear for concrete of the types included in this Work, with load modification factors for temperature, spacing, edge distance, and other installation variables.
 - 3. Handling and storage instructions.

- B. Quality control submittals:
 - 1. Special inspection: Detailed step-by-step instructions for the special inspection procedures required by the building code specified in Section 01410 - Regulatory Requirements.
 - 2. For each adhesive to be used, Evaluation Report confirming that the product complies with the requirements of AC308 for both un-cracked and cracked concrete and for use in Seismic Design Categories A through F.
 - 3. Installer qualifications:
 - a. Submit evidence of successful completion of adhesive manufacturer's installation training program.
 - b. Submit evidence of current certification for installation of inclined and overhead anchors under sustained tension loading.
- C. Inspection and testing reports:
 - 1. Inspections: Field quality control: Reports of inspections and tests.
 - a. Inspections: Field quality assurance: Reports of special inspections and tests.

1.05 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Installation requirements:
 - a. Have available at the site, and install anchors in accordance with, the adhesive manufacturer's printed installation instructions.
 - 2. Installer qualifications:
 - a. Demonstrating successful completion of adhesive manufacturer's on-site training program for installation of adhesive-bonded anchors.
 - b. Holding current certification for installation of adhesive-bonded anchors by a qualified organization acceptable to the Engineer and to the Building Official.
 - 1) Organizations/certification programs deemed to be qualified are:
 - a) ACI-CRSI Adhesive Anchor Installer Certification Program.
 - b) Adhesive anchor manufacturer's certification program, subject to acceptance by the Engineer and the Building Official.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store and protect products as follows, unless more restrictive requirements are recommended by the manufacturer:
 - 1. Store adhesives and adhesive components on pallets or shelving in a covered-storage area protected from weather.
 - 2. Control temperature to maintain storage within manufacturer's recommended temperature range.
 - a. If products have been stored at temperatures outside manufacturer's recommended range, test by methods acceptable to the Engineer to confirm acceptability before installing in the Work.
 - 3. Dispose of products that have passed their expiration date.

1.07 PROJECT CONDITIONS

- A. As specified in Section 01612 - Seismic Design Criteria.
- B. Seismic Design Category (SDC) for structures is A.

PART 2 PRODUCTS

2.01 GENERAL

- A. Like items of materials: Use end products of one manufacturer in order to achieve structural compatibility and singular responsibility.
- B. Adhesives shall have a current Evaluation Report documenting testing and compliance with the requirements of ACI 355.4 and of ICC-ES AC308 for use with un-cracked concrete and with cracked concrete in the Seismic Design Category specified.
- C. Bond reinforcing bars and all thread rods in concrete using epoxy adhesive unless other adhesives specified are specifically indicated on the Drawings or approved in writing by the Engineer.

2.02 EPOXY ADHESIVE

- A. Materials:
 - 1. Meeting the physical requirements of ASTM C881, Type IV, Grade 3, Class B or C depending on site conditions.
 - 2. 2-component, 100 percent solids, insensitive to moisture.
 - 3. Cure temperature, pot life, and workability: Compatible with intended use and environmental conditions.
- B. Packaging:
 - 1. Disposable, self-contained cartridge system furnished in side-by-side cartridges designed to fit into a manually or pneumatically operated caulking gun, and with resin and hardener components isolated until mixing through manufacturer's static mixing nozzle.
 - a. Nozzle designed to dispense components in the proper ratio and to thoroughly blend the components for injection from the nozzle directly into prepared hole.
 - b. Provide nozzle extensions as required to allow full-depth insertion and filing from the bottom of the hole.
 - 2. Container markings: Include manufacturer's name, product name, batch number, mix ratio by volume, product expiration date, ANSI hazard classification, and appropriate ANSI handling precautions.
- C. Manufacturers: One of the following or equal:
 - 1. Hilti, Inc., HIT-RE 500-V3.
 - 2. Simpson Strong-Tie Co., Inc., SET-XP.

2.03 ALL THREAD RODS

- A. Materials: As specified in section SP720S – Metal for Structures or indicated on drawings.

2.04 REINFORCING BARS

- A. As specified in Section 406S and SP406S -Reinforcing Steel.

PART 3 EXECUTION

3.01 GENERAL

- A. Execution of this work is restricted to installers who have personally completed the adhesive manufacturer's on-site training for the products to be installed, and who are personally certified through a qualified certification program described under Quality Assurance and accepted by the Engineer and the Building Official.
 - 1. Do not install holes or adhesive until training is complete.
- B. Perform work in strict compliance with the accepted MPII and the following instructions. Where the accepted MPII and the instructions conflict, the MPII shall prevail.
- C. Install reinforcing bars and all thread rods to embedment depth, and at spacing and locations indicated on the Drawings.
 - 1. If embedment depth is not indicated, contact Engineer for requirements.
 - 2. Do not install adhesive-bonded all thread rods or reinforcing bars in upwardly inclined or overhead applications unless accepted in advance by Engineer.

3.02 PREPARATION

- A. Do not begin installation of adhesive bonded anchors until:
 - 1. Concrete has achieved an age of at least 21 days after placement.
 - 2. On-site training in installation of adhesive bonded anchors by manufacturer's technical representative is complete. Do not drill holes in concrete or install adhesive and embeds in holes.
- B. Review manufacturer's printed installation instructions (MPII) and "conditions of use" stipulated in the Evaluation Report before beginning work.
 - 1. Bring to the attention of the adhesive manufacturer's technical representative any discrepancies between these documents, and resolve before proceeding with installation.
- C. Install adhesive bonded anchors in full compliance with manufacturer's printed installation instructions using personnel who have successfully completed manufacturer's on-site training for products to be used and who hold certifications specified in this Section.
- D. Confirm that adhesive and substrate receiving adhesive are within manufacturer's recommended range for temperature and moisture conditions, and will remain so during the curing time for the product.

3.03 HOLE SIZING AND INSTALLATION

- A. Drilling holes:
 - 1. Determine location of reinforcing bars or other obstructions with a nondestructive indicator device, and mark locations with construction crayon on the surface of the concrete.
 - 2. Do not damage or cut existing reinforcing bars, electrical conduits, or other items embedded in the existing concrete without prior acceptance by Engineer.

- B. Hole drilling equipment:
 - 1. Electric or pneumatic rotary impact type with medium or light impact.
 - a. Installation of anchors in cored holes is not permitted.
 - b. Set drill to "rotation only" mode, or to "rotation plus hammer" mode in accordance with the manufacturer's installation instructions and the requirements of the Evaluation Report.
 - c. Where edge distances are less than 2 inches and "rotation plus hammer" mode is permitted, use lighter impact equipment to prevent micro-cracking and concrete spalling during the drilling process.
 - 2. Drill bits: Carbide-tipped in accordance with ANSI B212-15 unless otherwise recommended by the manufacturer or required as a "condition of use" in the Evaluation Report.
 - a. Hollow drill bits with flushing air systems are preferred. Air supplied to hollow drill bits shall be free of oil, water, or other contaminants that will reduce bond.
- C. Hole diameter: As recommended in the manufacturer's installation instructions and the Evaluation Report.
- D. Hole depth: As recommended in the manufacturer's installation instructions to provide minimum effective embedment indicated on the Drawings.
- E. Obstructions in drill path:
 - 1. If an existing reinforcing bar or other obstruction is hit while drilling a hole, unless otherwise accepted by Engineer, stop drilling. Prepare and fill the hole with dry-pack mortar. Relocate the hole to miss the obstruction and drill another hole to the required depth.
 - a. Obtain Engineer's acceptance of distance between abandoned and relocated holes before proceeding with the relocation.
 - b. Allow dry-pack mortar to cure to a strength equal to that of the surrounding concrete before resuming drilling in the area.
 - c. Epoxy grout may be substituted for dry-pack mortar when accepted by Engineer.
 - 2. Avoid drilling an excessive number of holes in an area of a structural member, which would excessively weaken the member and endanger the stability of the structure.
 - 3. When existing reinforcing steel is encountered during drilling and when specifically accepted by Engineer, enlarge the hole by 1/8 inch, core through the existing reinforcing steel at the larger diameter, and resume drilling at original hole diameter using pneumatic rotary impact drill.
 - 4. Bent bar reinforcing bars: Where edge distances are critical, and interference with existing reinforcing steel is likely, if acceptable to Engineer, drill hole at 10 degree (or less) angle from axis of reinforcing bar or all thread rod being installed.
- F. Cleaning holes:
 - 1. Insert air nozzle to bottom of hole and blow out loose dust.
 - a. Use compressed air that is free of oil, water, or other contaminants that will reduce bond.
 - b. Provide minimum air pressure of 90 pounds per square inch for not less than 4 seconds.

2. Using a stiff bristle brush with diameter that provides contact around the full perimeter of the hole, vigorously brush hole to dislodge compacted drilling dust.
 - a. Insert brush to the bottom of the hole and withdraw using a simultaneous twisting motion.
 - b. Repeat at least 4 times.
3. Repeat the preceding steps as required to remove drilling dust or other material that will reduce bond, and in the number of cycles required by the MPII and the Evaluation Report.
4. Leave prepared holes clean and dry.
5. Protect prepared and cleaned holes from contamination and moisture until adhesive is installed.
6. Re-clean and dry previously prepared holes if, in the opinion of the Engineer, the hole has become contaminated after initial cleaning.

3.04 INSTALLATION OF ADHESIVE AND INSERTS

- A. Clean and prepare inserts reinforcing bars and all thread rods:
 1. Prepare embedded length of reinforcing bars and all thread rods by cleaning to bare metal. Inserts shall be free of oil, grease, paint, dirt, mill scale, rust, or other coatings that will reduce bond.
 2. Solvent clean prepared reinforcing bars and all thread rods over the embedment length in accordance with SSPC SP-1. Provide an oil and grease free surface for bonding of adhesive to steel.
- B. Fill holes with adhesive:
 1. Starting at the bottom of the hole, fill hole with adhesive inserting the reinforcing bar or all thread rod.
 2. Fill hole as nozzle is withdrawn without creating air voids.
 3. Unless otherwise indicated on the Drawings, fill hole with sufficient adhesive so that excess adhesive is extruded out of the hole when the reinforcing bar or all thread rod is inserted.
 4. Where necessary, seal hole at surface of concrete to prevent loss of adhesive during curing.
- C. Installing reinforcing bars and all thread rods.
 1. Unless otherwise indicated on the Drawings, install bars and rods perpendicular to the concrete surface.
 2. Insert reinforcing bars and all thread rods into adhesive in accordance with manufacturer's recommended procedures.
 3. Confirm that insert has reached the designated embedment in the concrete, and that adhesive completely surrounds the embedded portion.
 4. Securely brace bars and all thread rods in place to prevent displacement while the adhesive cures. Bars and rods displaced during curing will be considered damaged and replacement will be required.
 5. Clean excess adhesive from the mouth of the hole.
- D. Curing and loading.
 1. Provide and maintain curing conditions recommended by the adhesive manufacturer for the period required to fully cure the adhesive at the temperature of the concrete.

2. Do not disturb or load bonded embeds until manufacturer's recommended cure time, based on temperature of the concrete, has elapsed.

3.05 POST-INSTALLATION ACTIVITIES

- A. Do not bend bars or all-thread rods after bonding to the concrete, unless accepted in advance by the Engineer.
- B. Attachments to all thread rods:
 1. After assemblies to be connected are placed, install nuts and washers for threaded rods as indicated on the Drawings.
 2. Draw nuts down tight, using practices specified for "snug tight" installation of bolts in steel to steel connections.

3.06 FIELD QUALITY CONTROL

- A. Provide field quality control over the Work of this Section as specified in section 01400 – Quality Control Services.
- B. Do not allow work described in this Section to be performed by individuals who do not hold the specified certifications and who have not completed the specified job site training.
- C. Manufacturer's services:
 1. Before beginning installation, furnish adhesive manufacturer's technical representative to conduct on-site training in proper storage and handling of adhesive, drilling and cleaning of holes, and preparation and installation of reinforcing bars and all thread rods.
 - a. Provide notice of scheduled training to Engineer and to Special Inspector(s) not less than 10 working days before training occurs. Engineer and Special Inspector may attend training sessions.
 2. Submit record, signed by the manufacturer's technical representative, listing Contractor's personnel who completed the training. Only qualified personnel who have completed manufacturer's on-site training shall perform installations.
- D. Field inspections and testing:
 1. Hole drilling and preparation.
 2. Results: Submit records of inspections and testing to Engineer by electronic copies within 24 hours after completion.

3.07 FIELD QUALITY ASSURANCE

- A. Provide field quality assurance over the Work of this Section as specified in section 01400 – Quality Control Services.
- B. Special inspections, special tests, and structural observation:
 1. Provide as specified in Section 01455 - Regulatory Quality Assurance.
 2. Frequency of inspections:
 - a. Unless otherwise indicated on the Drawings or in this Section, provide periodic special inspection as required by the Evaluation Report for the product installed.

- b. Provide continuous inspection for the initial installation of each type and size of adhesive bonded reinforcing bar and all thread rod. Subsequent installations of the same anchor may be installed with periodic inspection as defined in subsequent paragraphs.
- 3. Preparation:
 - a. Review Drawings and Specifications for the Work to be observed.
 - b. Review adhesive manufacturer's MPII and recommended installation procedures.
 - c. Review Evaluation Report "Conditions of Use" and "Special Inspection" requirements.
- 4. Inspection: Periodic:
 - a. Initial inspection. Provide an initial inspection for each combination of concrete and reinforcing bar strength or concrete strength and all thread rod material being installed. During initial inspection, observe the following for compliance with the installation requirements.
 - 1) Concrete: Class (minimum specified compressive strength) and thickness.
 - 2) Environment: Temperature conditions at work area, and moisture conditions of concrete and drilled hole.
 - 3) Holes: Locations, spacing, and edge distances; verification of drill bit compliance with requirements; cleaning equipment and procedures; cleanliness of hole. Before adhesive is placed, confirm that depth and preparation of holes conforms to the requirements of the Contract Documents, the MPII, and the "conditions of use" listed in the Evaluation Report.
 - 4) Adhesive: Product manufacturer and name; lot number and expiration date; temperature of product at installation; installation procedure. Note initial set times observed during installation.
 - 5) Reinforcing bars and all thread rods: Material diameter and length; steel grade and/or strength; cleaning and preparation; cleanliness at insertion; minimum effective embedment provided.
 - b. Subsequent inspections: Subsequent installations of the same reinforcing bars or all thread rods may be performed without the presence of the special inspector, provided that:
 - 1) There is no change in personnel performing the installation, the general strength and characteristics of the concrete receiving the inserts, or the reinforcing bars and all thread rods being used.
 - 2) For ongoing installations, the special inspector visits the site at least once per day during each day of installation to observe the work for compliance with material requirements and installation procedures.
- 5. Inspection: Continuous.
 - a. Make observations as described under "Inspection - Periodic, Initial Inspection" during all drilling, cleaning, and bonding activities for all bars and rods installed.
- 6. Records of inspections:
 - a. Provide a written record of each inspection using forms acceptable to the Engineer and to the Building Official.
 - b. Submit electronic copies of inspection reports to Engineer within 24 hours after completion of inspection.

END OF SECTION

SECTION 03072

EPOXY RESIN/PORTLAND CEMENT BONDING AGENT

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Epoxy resin/portland cement bonding agent.

1.02 REFERENCES

- A. ASTM International (ASTM):
 1. C109 - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens).
 2. C348 - Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars.
 3. C496 - Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens.
 4. C882 - Standard Test Method for Bond Strength of Epoxy-Resin Systems Used With Concrete By Slant Shear.
- B. Federal Highway Administration (FHWA):
 1. FHWA-RD-86-193 - Highway Concrete Pavement Technology Development and Testing Volume V: Field Evaluation of SHRP C9206 Test Sites (Bridge Deck Overlays).

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Sika Corp., Sika Armatec 110.
- B. Substitutions: The use of other than the specified product will be considered, providing the Contractor requests its use in writing to the Engineer. This request shall be accompanied by:
 1. A certificate of compliance from an approved independent testing laboratory that the proposed substitute product meets or exceeds specified performance criteria, tested in accordance with the specified test standards.
 2. Documented proof that the proposed substitute product has a 1-year proven record of performance of bonding portland cement mortar/concrete to hardened portland cement mortar/concrete, confirmed by actual field tests and 5 successful installations that the Engineer can investigate.

2.02 MATERIALS

- A. Epoxy resin/portland cement adhesive:
 1. Component "A" shall be an epoxy resin/water emulsion containing suitable viscosity control agents. It shall not contain butyl glycidyl ether.
 2. Component "B" shall be primarily a water solution of a polyamine.

3. Component "C" shall be a blend of selected portland cements and sands.
4. The material shall not contain asbestos.

2.03 DESIGN AND PERFORMANCE CRITERIA

- A. Properties of the mixed epoxy resin/portland cement adhesive:
 1. Pot life: 75 to 105 minutes.
 2. Contact time: 24 hours.
 3. Color: Dark gray.
- B. Properties of the cured epoxy resin/portland cement adhesive:
 1. Compressive strength in accordance with ASTM C109:
 - a. 3 day: 4,500 pounds per square-inch minimum.
 - b. 7 days: 6,500 pounds per square-inch minimum.
 - c. 28 days: 8,500 pounds per square-inch minimum.
 2. Splitting tensile strength in accordance with ASTM C496:
 - a. 28 days: 600 pounds per square-inch minimum.
 3. Flexural strength:
 - a. 1,100 pounds per square-inch minimum in accordance with ASTM C348.
 4. Bond strength in accordance with ASTM C882 modified at 14 days:
 - a. 0 hours open time: 2,800 pounds per square-inch minimum.
 - b. 24 hours open time: 2,600 pounds per square-inch minimum.
 5. The epoxy resin/portland cement adhesive shall not produce a vapor barrier.
 6. Material must be proven to prevent corrosion of reinforcing steel when tested under the procedures as set forth by the FHWA Program Report Number FHWA-RD-86-193. Proof shall be in the form of an independent testing laboratory corrosion report showing prevention of corrosion of the reinforcing steel.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Mixing the epoxy resin: Shake contents of Component "A" and Component "B." Empty all of both components into a clean, dry mixing pail. Mix thoroughly for 30 seconds with a jiffy paddle on a low-speed with 400 to 600 revolutions per minute drill. Slowly add the entire contents of Component "C" while continuing to mix for a minimum of 3 minutes and until uniform with no lumps. Mix only the quantity that can be applied within its pot life.
- B. Placement procedure:
 1. Apply to prepared surface with stiff-bristle brush, broom, or "hopper-type" spray equipment:
 - a. For hand applications: Place fresh plastic concrete/mortar while the bonding bridge adhesive is wet or dry, up to 24 hours.
 - b. For machine applications: Allow the bonding bridge adhesive to dry for 12 hours minimum.
- C. Adhere to all limitations and cautions for the epoxy resin/portland cement adhesive in the manufacturer's current printed literature.

3.02 CLEANING

- A. Leave finished work and work area in a neat, clean condition without evidence of spillovers onto adjacent areas.

END OF SECTION

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SECTION 03160

STEEL SHEET PILING

PART 1 GENERAL

1.01 SUMMARY

- A. This Section includes the furnishing and installation of rolled steel sheet piles for permanent support of site excavation, riverbank stabilization, and flood plain protection as shown on PLANS and as specified herein.

1.02 RELATED REQUIREMENTS

- A. Review installation procedures under other Sections and coordinate with the work related to this Section.
- B. Related work as called for on PLANS or specified in Specification Section 09800, "Sheet Piling Coating".

1.03 REFERENCES

- A. The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by basic designation only.
 - 1. American Institute of Steel Construction (AISC), Latest Editions:
 - a. AISC 326: Structural Steel Detailing Manual
 - b. AISC 348: Specification for Structural Joints using ASTM A325 or A490 Bolts
 - 2. ASTM International (ASTM), Latest Editions:
 - a. ASTM A36/A36M: Standard Specification for Carbon Structural Steel
 - b. ASTM A992/A992M: Standard Specification for Structural Steel Shapes
 - c. ASTM A325: Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimal Tensile Strength
 - d. ASTM A572/A572M: Standard Specification for High-Strength Low Alloy Columbium-Vanadium Steel of Structural Quality, Grade 50 ksi
 - e. ASTM A588/A588M: Standard Specification for High-Strength Low Alloy Structural Steel with 50 ksi Minimum Yield Point to 4 inches (100 mm) Thick
 - 3. American Welding Society (AWS)
 - a. D1.1: Structural Welding Code – Steel
 - 4. Occupational Safety and Health Administration (OSHA)
 - a. Safety and Health Standards for the Construction Industry, 29 CFR 1926 Subpart R Safety Standards for Steel Erection

1.04 DEFINITIONS (NOT USED)

1.05 PERFORMANCE (NOT USED)

1.06 SUBMITTALS

- A. Furnish in accordance with Specifications Section 01300, "Submittals" and Section 01730, "Operation and Maintenance Data".
1. Shop Drawings. In addition to the items specified in Specification Section 01300, "Submittals", furnish the following:
 - a. Submit a list of not less than 5 installations where sheet piling of the type and approximate size specified has been in successful operation for at least 2 years.
 - b. Submit records of the completed sheet piling driving operations, including a system of identification which shows the disposition of approved piling in the work, driving equipment performance data, piling penetration rate data, piling dimensions, and top and bottom elevation of installed piping.
 - c. Submit descriptive literature including a cross-sectional view of each support item, which indicated materials of construction, weights, principal dimensions and other important details.
 - d. Installation instructions and drawings showing steel connections and piping penetrations.
 - e. Large-scale dimension drawings showing all units in orientation as shown on PLANS.
 - f. Description and quantity of each part supplied. Description to include catalog cuts and materials of construction.
 - g. Sheet Pile Drivability Report that determines the equipment to be used and develop the procedures for installation.
 2. Design submittal that defines the method of incorporating the proposed pipe crossings through the sheet pile at the locations shown on the drawings. Design shall be prepared and sealed by a registered professional engineer in the state of Texas.
 3. Operation and Maintenance Manuals: Furnish in accordance with Specification Section 01730, "Operation and Maintenance Data":
 - a. Operating and maintenance instructions and parts lists. A list of recommended spare parts other than those specified. Predicted life of parts subject to wear.
 4. Certified Report: Furnish copies of a report prepared by manufacturer's technical representative certifying the following conditions.
 - a. Submit manufacturer's certification that he has carefully examined the TECHNICAL SPECIFICATIONS in detail, including the arrangement and conditions of proposed steel connections affecting the performance of the sheet piling, and the detailed requirements of manufacturing and subsequent installation of the piling.

1.07 QUALITY ASSURANCE

- A. All steel sheet piling systems shall be installed by a qualified Contractor with 5-years experience minimum in successful erection of steel sheet piling.
- B. System Coordination: CONTRACTOR is responsible for all details necessary to properly install, adjust, and place in operation complete working system.

- C. Welding Qualification and Certification
 - 1. Furnish written welding procedure for welds in conformance with the AWS D 1.1.
 - 2. Each welder, welding operator and tack welder shall be certified by test to perform type of work required in conformance with AWS D 1.1.
 - 3. If a welder or welding operator has not been engaged in a specific welding process for a period of six months or more, that individual shall be deemed unqualified and shall not perform work on the project until the individual has been qualified again by testing in conformance with AWS D 1.1.
 - 4. Maintain duplicate qualification and certification records at the job site readily available for examination.
- D. Tolerances
 - 1. Maintain tolerances conforming to AISC Code of Standard Practice
 - 2. Permissible variation tolerances conforming to ASTM A6 and A328.
- E. Materials, fabrications and workmanship found defective shall be promptly removed and replaced and new acceptable work shall be provided in accordance with Contract requirements at no additional cost to the Owner.

1.08 DELIVERY, STORAGE AND HANDLING

- A. Delivery: Materials shall be delivered to the site in an undamaged condition and at such intervals as will avoid delay in the work.
- B. Storage: Materials shall be stored and protected in a clean, properly drained location. Materials shall be kept off the ground under a weather-tight covering, permitting good air circulation. Materials shall be protected from distortion, excessive stresses, corrosion and other damage.
- C. Handling: Handle unit to prevent damage during unloading and installation. Follow manufacturer's instructions on lifting and setting.

1.09 FIELD MEASUREMENTS

- A. CONTRACTOR shall verify dimensions and make any field measurements necessary and be fully responsible for accuracy and layout of the work.
- B. CONTRACTOR shall review the approved shop drawings and report any discrepancies to the design engineer for clarification prior to starting fabrication.

PART 2 PRODUCTS

2.01 MANUFACTURER(S)

- A. Nucor Skyline
- B. CMI Limited Co.
- C. Or Owner/Engineer approved equal

2.02 MATERIALS AND/OR EQUIPMENT

A. Steel Piles

1. Hot rolled steel sheet piles conforming to ASTM A 572/A 572M, Grade 50 ksi.
2. Construction plans and specifications indicate sheet pile has been designed to be Grade 50 ksi, hot rolled steel sheet pile of NZ-19 section. Alternatively, Contractor may select an alternative steel sheet pile section provided it complies with the following minimum requirements:
 - a. Grade: 50 ksi
 - b. Minimum flange thickness: 0.375 inch
 - c. Maximum flange thickness: 0.375 inch
 - d. Cross sectional area: 7.07 in²/ft
 - e. Section modulus - elastic: 35.08 in³/ft
 - f. Section modulus - plastic: 41.33 in³/ft
 - g. Moment of inertia: 283.1 in⁴/ft
3. Use of an alternative steel sheet pile section requires Contractor to assume full responsibility for alternative steel sheet pile.
4. Sheet piling shall be full-length sections of the dimensions shown on Drawings. Provide fabricated sections conforming to the requirement and the piling manufacturer's recommendations for fabricated sections. Provide sheet piling with standard pulling holes.

B. Interlocks

1. The interlocks of sheet piling shall be free-sliding, provide a swing angle suitable for the intended installation but not less than 5 degrees when interlocked, and maintain continuous interlocking when installed.

C. Pile Driving Equipment

1. A copy of the geotechnical data report for the project site is included in this bid package for contractor's information only. It is the contractor's responsibility to perform all necessary geotechnical investigation and drivability study to select the equipment and develop the procedures.

D. Miscellaneous Structural Steel

1. Structural Steel Shapes – Conform to the following:
 - a. W Shapes: ASTM A992, 50 ksi
 - b. S, C, and MC Shapes: ASTM A36
 - c. L Shapes: ASTM A36
 - d. HSS Square and Rectangular Shapes: ASTM A500, Grade B, 46 ksi
 - e. HSS Round Shapes: ASTM A500, Grade B, 42 ksi
 - f. Pipe Shapes: ASTM A53, Grade B, 35 ksi
 - g. Plates and Bars: ASTM A36
2. Connection Bolts Steel Members: Conform to ASTM F3125 Grade 325.

E. Coatings

1. Steel Sheet Piles - Coal tar epoxy coating of color to be approved by Owner.
2. Comply with Specification Section 09800, "Sheet Piling Coating" for coating requirements.

PART 3 EXECUTION

3.01 ERECTION/INSTALLATION/APPLICATION AND/OR CONSTRUCTION

- A. Installation:
1. Follow manufacturer's and supplier's instructions and approved shop drawings for installation of equipment.
 2. Set sheet piling in accordance with approved shop drawings.
 3. Drive piling to founding elevation shown on approved shop drawings to within 0.25 foot.
 4. Drive sheet piling to within 1 inch of plumb.
 5. When using ball and socket piling, drive socket end over ball end.
 6. Drive sheet piling with properly equipped pile driving hammer, including vibratory hammers. Jetting is prohibited.
 7. Replace piling damaged during placement or during course of construction at no additional cost to Owner.
- B. Cut-offs
1. Drive piling to elevations shown on Drawings.
 2. Cut sheet piling by flame, saw, or grinding.
 3. Top of piling to be straight and true, with lip metal removed and elevation as shown on approved shop drawings to within 1 inch.
- C. Straightening Bent Material
1. Straighten sheet piling by methods that will not produce fracture or other injury to material.
 2. Straighten individual pieces prior to assembly.
- D. Fasteners
1. Punch or drill holes.
 2. Size and style of fasteners as shown on approved shop drawings.
- E. Field Welding
1. Weld sheet piling, if required, with low-hydrogen type electrode, per AWS D1.1.
 2. Butt weld splices only.
 3. Do not perform field welding without preheating, if ambient temperature is below 60°F, and maintain interpass temperature at 60°F or above.
 4. No butt welds to be visible (exposed) at completion of project.
 5. Deposited material for welds of sheet piling to have similar atmospheric corrosion resistance.
 6. Splicing two consecutive piles not permitted.
- F. If Contractor chooses to use sheet piling for excavation support in areas other than those shown on Drawings, sheet piling shall be removed after backfill, unless the sheet piling is between structures less than five feet apart, or approved by Engineer.^{AD5}

3.02 FIELD QUALITY CONTROL

- A. Field Weld Inspection of all structural welds of Sheet Piling is required by means of non-destructive testing, as specified within AWS-CWI. Repair of any defects to be completed at no additional cost to the OWNER.

3.03 PAINTING/COATING

- A. Shop apply the specified coating to all exterior and interior surfaces of the sheet piles, full length of the sheet piles.
- B. Field apply the specified coating to miscellaneous steel members and their connections and to touch up shop-applied coating. Field-applied epoxy coating shall be compatible to the shop-applied epoxy coating.
- C. Comply with requirements of Specification Section 09800, "Sheet Piling Coating" for application of coating.
- D. Comply with the written application instructions of the coating manufacturer.

3.04 MEASUREMENT AND PAYMENT

- A. No separate measurement or payment for work performed under this Section. Include cost of same in Contract price bid for work of which this is a component part.

END OF SECTION

SECTION 03350

CONCRETE FINISHING

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Finishing concrete floors and floor toppings.
 - 2. Floor surface treatment.
- B. Related sections:
 - 1. Section 410S – Concrete Structures: Prepared concrete floors ready to receive finish; control and formed expansion and contraction joints and joint devices. In Section 03550 – Polished Concrete, Section 07900 - Joint Sealers and Section 09670 – Fluid-Applied Flooring.

1.02 REFERENCES

- A. American Concrete Institute:
 - 1. ACI 301 - Specifications for Structural Concrete.
 - 2. ACI 302.1 - Guide for Concrete Floor and Slab Construction.
- B. ASTM International:
 - 1. ASTM E1155 - Standard Test Method for Determining F_F Floor Flatness and F_L Floor Levelness Numbers.
- C. California Department of Health Services:
 - 1. CA/DHS/EHLB/R-174 - Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers, including 2004 Addenda.

1.03 SUBMITTALS

- A. Section 01300 – Submittals: Submittal procedures.
- B. Product Data: Submit data on concrete hardener, sealer, and curing compounds, and slip resistant treatment, compatibilities, and limitations.

1.04 SUSTAINABLE DESIGN SUBMITTALS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify that products meet or exceed specified sustainable design requirements.
 - 1. Indoor Air Quality Certificates:
 - a. Certify VOC content for each flooring system.

1.05 CLOSEOUT SUBMITTALS

- A. Section 01700 – Contract Closeout: Closeout procedures.
- B. Operation and Maintenance Data: Submit data on maintenance renewal of applied coatings.

1.06 QUALITY ASSURANCE

- A. Perform Work in accordance with ACI 301 and ACI 302.1.

1.07 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.
- B. Applicator/Installer: Company specializing in performing work of this section with minimum three years documented experience.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Section 01600 - Product Requirements: Product storage and handling requirements.
- B. Deliver materials in manufacturer's packaging including application instructions.

1.09 ENVIRONMENTAL REQUIREMENTS

- A. Section 01600 - Product Requirements: Environmental conditions affecting products on site.
- B. Temporary Lighting: Minimum 200 W light source, placed 8 feet above floor surface, for each 425 sq ft of floor being finished.
- C. Temporary Heat: Ambient temperature of 50 degrees F minimum.
- D. Ventilation: Sufficient to prevent injurious gases from temporary heat or other sources affecting concrete.

1.10 COORDINATION

- A. Section 01300 - Submittals: Coordination and project conditions.
- B. Coordinate the Work with concrete floor placement and concrete floor curing.

PART 2 PRODUCTS

2.01 COMPOUNDS - HARDENERS AND SEALERS

- A. Exposed Aggregate Retarder for Flat Surfaces:
 - 1. Manufacturers:
 - a. Bomanite; Sandstone texture.
 - b. Scofield Systems; Lithotex Top Surface Retarder.
 - c. Substitutions: Section 01600 - Product Requirements.

2.02 SLIP RESISTANT TREATMENT

- A. Slip Resistant Finish: Micronized polymer
 - 1. Manufacturers:
 - a. Euclid Company; Euco Grip.
 - b. H&C; SharkGrip Slip Resistant Additive.
 - c. Substitutions: Section 01600 - Product Requirements.

2.03 SUSTAINABILITY CHARACTERISTICS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design compliance.
- B. Indoor Environmental Quality Characteristics:
 - 1. Interior Concrete: Maximum VOC content according to SCAQMD Rule 1113, including sealers.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Section 01300 - Submittals: Coordination and project conditions.
- B. Verify floor surfaces are acceptable to receive the Work of this section.

3.02 FLOOR FINISHING

- A. Finish concrete floor surfaces in accordance with ACI 301 and ACI 302.1.
- B. Wood float surfaces receiving ceramic tile with full bed setting system.
- C. Steel trowel surfaces which are scheduled to be exposed.
- D. In areas with floor drains, maintain design floor elevation at walls; slope surfaces uniformly to drains at 1/8 inch per foot nominal and as indicated on Drawings.
- E. Broom finish at exterior concrete

3.03 FLOOR SURFACE TREATMENT

- A. Apply dry shake hardener as scheduled on floor and other concrete surfaces.
- B. Apply slip resistant finish as scheduled on floor and other concrete surfaces.
 - 1. Mix slip resistant material into sealer to be applied, or broadcast over first coat of sealer while still wet and top coat with sealer, according to manufacturer's instructions.
- C. Apply retarder to exposed aggregate as scheduled on floor surfaces.

3.04 TOLERANCES

- A. Section 01400 - Quality Control Services: Tolerances.
- B. Measure for F_F and F_L tolerances for floors in accordance with ASTM E1155, within 48 hours after slab installation.
- C. Finish concrete to achieve the following tolerances:
 - 1. Under Glazed Tile on Setting Bed: F_F 25 (specified overall) F_F 17 (minimum local) and F_L 20 (specified overall) F_L 15 (minimum local).
 - 2. Under Resilient, Thin-set Flooring, Carpet Finishes, and areas not outlined otherwise in this article: F_F 35 (specified overall) F_F 24 (minimum local) and F_L 25 (specified overall) F_L 17 (minimum local).
 - 3. Exposed to View and Foot Traffic: F_F 45 (specified overall) F_F 30 (minimum local) and F_L 35 (specified overall) F_L 24 (minimum local).
 - 4. Areas where polished concrete finishing is scheduled: F_F 50 (specified overall) F_F 45 (minimum local) and F_L 30 (specified overall) and F_L 25 (minimum local).
 - 5. Exposed to view in utility areas (mechanical, electrical, general storage): F_F 25 (specified overall) F_F 17 (minimum local) and F_L 20 (specified overall) F_L 15 (minimum local).
 - 6. Correct slab surface when actual F_F or F_L number for floor installation measures less than required.
- D. Correct defects in defined traffic floor by grinding, removal and replacement of defective Work, or other methods approved by Architect. Areas requiring corrective Work will be identified. Re-measure corrected areas by same process.

3.05 SCHEDULES

- A. Reference finish schedule and floor finish plan for more information.

END OF SECTION

SECTION 03550

POLISHED CONCRETE FINISHING

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Polished Concrete Floor System.
- B. Related Sections:
 - 1. Section 410S – Concrete Structures: Prepared concrete floors ready to receive finish; control and formed expansion and contraction joints and joint devices, and concrete curing.
 - 2. Section 03350 – Concrete Finishing, Section 07900 - Joint Sealers, and Section 09670 – Fluid-Applied Flooring.

1.02 REFERENCES

- A. American Concrete Institute:
 - 1. ACI 301 - Specifications for Structural Concrete.
 - 2. ACI 302.1 - Guide for Concrete Floor and Slab Construction.
- B. ASTM International:
 - 1. ASTM C 1028 – Standard Test Method for Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method.
 - 2. ASTM D 523 – Standard Test Method for Specular Gloss.
 - 3. ASTM E1155 - Standard Test Method for Determining F_F Floor Flatness and F_L Floor Levelness Numbers.
- C. California Department of Health Services:
 - 1. CA/DHS/EHLB/R-174 - Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers, including 2004 Addenda.

1.03 SYSTEM DESCRIPTION

- A. Installation of polished concrete floor system for new interior concrete floors by dry grinding and polishing with various size grit metal-bonded and resin-bonded diamonds and application of concrete densifier.

1.04 PERFORMANCE REQUIREMENTS

- A. Improve performance of floor by installation of polished concrete floor system as measured by the following criteria:
 - 1. Static Coefficient of Friction, ASTM C 1028:
 - a. Dry Surface: 0.47
 - b. Wet Surface: 0.62

2. Specular Gloss/Reflectance, ASTM D523:
 - a. 20 degrees: 6.4 degrees.
 - b. 60 degrees: 40.3 degrees.
 - c. 85 degrees: 84.7 degrees
3. Floor Surface Profile, ASTM E1155:
 - a. Floor Flatness Number (F_F): 50 (specified overall), 45 (minimum local).
 - b. Floor Levelness Number (FL): 35 (specified overall), 30 (minimum local).

1.05 SUBMITTALS

- A. Section 01300 – Submittals: Submittal procedures.
- B. Product Data: Submit data on concrete densifier, and sealer, including compatibilities and limitations.
- C. Manufacturer's Installation Instructions: Surface preparation and installation instructions.
- D. Installer's Certification: Submit IPCI certification of installer and installer's employees.
- E. Installer's Project References: Submit installer's list of successfully completed polished concrete floor system projects, including project name and location, name of architect, and type and quantity of polished concrete floor system installed.
- F. Maintenance Manual: Submit installer's maintenance manual, including maintenance and cleaning instructions for polished concrete floor system.

1.06 CLOSEOUT SUBMITTALS

- A. Section 01700 – Contract Closeout: Closeout procedures.
- B. Operation and Maintenance Data: Include recommended cleaning methods, cleaning materials, stain removal methods, and polishes and waxes,

1.07 QUALIFICATIONS

- A. Installers Qualifications:
 1. Certified IPCI installer.
 2. Employ IPCI Certified Craftsmen for installation of polished concrete floor system.

1.08 PRE-INSTALLATION MEETINGS

- A. Section 01400 – Quality Control Services: Pre-installation meetings.
- B. Pre-Concrete Pour Installation Meeting:
 1. Pre-installation meeting for work of Section 410S – Concrete Structures at least one week prior to pour.
 2. Require attendance of parties directly affecting work of this section, including Owner, Contractor, Architect, concrete installer, and polishing system installer.

3. Review requirements for environmental conditions, concrete tolerances, surface preparation, floating and troweling, installation procedures, allowable concrete additives or applied hardeners, sealers, etc., field quality control, application of saw cuts, repair, protection, and coordination with other work.
- C. Pre-Polishing Installation Meeting:
1. Convene minimum one week prior to commencing Work of this section.
 2. Require attendance of parties directly affecting work of this section, including Owner, Contractor, Architect, and installer.
 3. Review examination, surface preparation, installation procedures, field quality control, protection, and coordination with other work.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Section 01600 - Product Requirements: Product storage and handling requirements.
- B. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- C. Store materials in clean, dry area indoors in accordance with manufacturer's instructions.
- D. Keep materials from freezing.
- E. Protect materials during handling and application to prevent contamination or damage.

1.10 ENVIRONMENTAL REQUIREMENTS

- A. Section 01600 - Product Requirements: Environmental conditions affecting products on site.
- B. Temporary Lighting: Minimum 200 W light source, placed 8 feet above floor surface, for each 425 sq ft of floor being finished.
- C. Temporary Heat: Ambient temperature of 50 degrees F minimum.
- D. Ventilation: Sufficient to prevent injurious gases from temporary heat or other sources affecting concrete.

1.11 COORDINATION

- A. Section 01300 - Submittals: Coordination and project conditions.
- B. Coordinate the Work with concrete placement, floating, troweling and curing to ensure cured surface is acceptable for polishing. Ensure curing compounds, sealers, hardeners, etc. are compatible with polishing system.

PART 2 PRODUCTS

2.01 INSTALLER

- A. Consult IPCI to find certified IPCI installers .
 - 1. International Polished Concrete Institute, PO Box 1174, Norris, Tennessee 37828. Toll Free (866) 421-9550. Fax (865) 494-0872. Website www.ipcionline.org. E-mail info@ipcionline.org .
 - 2. Substitutions: Section 01600 - Product Requirements.

2.02 EQUIPMENT TO BE USED FOR INSTALLATION

- A. Floor Grinder:
 - 1. Model: Concrete Polishing Solutions "G-320". (or equivalent)
 - 2. Type: Multi-orbital, planetary-action, opposing-rotational, diamond-headed floor grinder.
 - 3. Weight: 850 pounds.
 - 4. Grinding Pressure: 675 pounds.
 - 5. Grinding Width: 32 inches.
 - 6. Motor: 15 HP.
 - 7. Maximum RPM: 1,750.
 - 8. Head: 3-head system contours to floor surface.
- B. Vacuum System:
 - 1. Model: Concrete Polishing Solutions "CAT 5 Dust Extractor". (or similar)
 - 2. Filtration: Direct-connect, HEPA filtration system.
- C. Diamond Tooling for Coating Removal, Initial Grinding, and Preparing Floor for Polishing:
 - 1. Concrete Polishing Solutions "MFL" 16-grit metal-bonded diamonds. (or similar)
 - 2. Concrete Polishing Solutions "MFL" 40-grit metal-bonded diamonds. (or similar)
 - 3. Concrete Polishing Solutions "MFL" 80-grit metal-bonded diamonds. (or similar)
 - 4. Concrete Polishing Solutions "MFL" 150-grit metal-bonded diamonds. (or similar)
- D. Diamond Tooling for Polishing Concrete:
 - 1. Concrete Polishing Solutions "GST" 100-grit resin-bonded diamonds. (or similar)
 - 2. Concrete Polishing Solutions "GST" 200-grit resin-bonded diamonds. (or similar)
 - 3. Concrete Polishing Solutions "GST" 400-grit resin-bonded diamonds. (or similar)
 - 4. Concrete Polishing Solutions "GST" 800-grit resin-bonded diamonds. (or similar)

2.03 MATERIALS

- A. Concrete Densifier:
 - 1. Concrete Polishing Solutions “Armor Densifier MFL”. (or similar)
 - a. Permanent sealing, densifying, and hardening compound for concrete.
 - b. Odorless.
 - c. VOC: 0.
 - d. Substitutions: Section 01600 - Product Requirements.
 - 2. Concrete Sealer:
 - a. Concrete Polishing Solutions “Armor Stain Shield MFL”. (or similar)
 - b. Substitutions: Section 01600 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Section 01380 – Construction Photography & Videos: Coordination and project conditions.
- B. Examine floor to receive polished concrete floor system.
- C. Notify Architect of conditions that would adversely affect installation or subsequent use.
- D. Do not begin surface preparation or installation until unacceptable conditions are corrected.
- E. Verify the Following for New Concrete Floors:
 - 1. Floor Finish: Bull-floated, smooth, pan-finished floor from edge to edge, with no rough areas.
 - 2. Floor and Joints:
 - a. Free of debris and excessive dirt, dust, clay, and mud.
 - b. Dry.
 - 3. Floor Surface Profile:
 - a. Floor Flatness Number (F_F): 50 (specified overall), 45 (minimum).
 - b. Floor Levelness Number (F_L): 35 (specified overall), 30 (minimum).
 - 4. Concrete Compressive Strength: 3,500 psi to 5,000 psi.
 - 5. Lightweight Concrete: Not allowed if aggregate exposure is required.
 - 6. Concrete Curing: Minimum 8 days water cured.
 - 7. Concrete Adjacent to Floor Penetrations: Troweled flat and level with surrounding concrete.
 - 8. Concrete Adjacent to Drains, clean-outs, etc: Finish level to the top of the structure.

3.02 SURFACE PREPARATION

- A. Protection: Protect surrounding areas and adjacent surfaces from the following:
 - 1. Minimal accumulation of dust from grinding and polishing.
 - 2. Contact with overspray of concrete densifier.
 - 3. Contact with overspray of concrete sealer.
- B. Preparation: Prepare surfaces in accordance with installer’s instructions.

- C. Clean Surfaces: Remove dirt, dust, debris, oil, grease, curing agents, bond breakers, paint, coatings, and other surface contaminants which could adversely affect installation of polished concrete floor system.

3.03 INSTALLATION

- A. Install polished concrete floor system in accordance with installer's instructions at locations indicated on the Drawings.
- B. Aggregate Exposure :
 - 1. Small Aggregate: Mottled salt-and-pepper course aggregate exposure.
- C. Polished Concrete Floor System: IPCI Sheen Level 3 – Median Gloss.
 - 1. Preparation Step:
 - a. Remove existing floor coatings by grinding with 16-grit metal-bonded diamonds.
 - b. Remove existing floor coatings and level floor by grinding with 40-grit metal-bonded diamonds.
 - c. Open-up concrete to accept concrete densifier by grinding with 80-grit metal-bonded diamonds.
 - 2. Apply concrete densifier to deeply saturate floor.
 - 3. Remove residue of concrete densifier dried on floor surface by grinding with 150-grit metal-bonded diamonds.
 - 4. Apply concrete sealer.
- D. Hand Tooling: When applicable for project, utilize similar grinding and polishing process to blend, with a variable speed polisher, the edges of perimeter areas where obstructions lie.

3.04 FIELD QUALITY CONTROL

- A. Inspect completed polished concrete floor system with Owner, Contractor, Architect, and Installer.
- B. Review procedures with Architect to correct unacceptable areas of completed polished concrete floor system.
- C. Testing: Test the following from completed polished concrete floor system:
 - 1. Static Coefficient of Friction, ASTM C 1028:
 - a. Dry Surface: 0.47
 - b. Wet Surface: 0.62
 - 2. Specular Gloss/Reflectance, ASTM D523:
 - a. 20 degrees: 6.4 degrees.
 - b. 60 degrees: 40.3 degrees.
 - c. 85 degrees: 84.7 degrees
 - 3. Floor Surface Profile, ASTM E1155:
 - a. Floor Flatness Number (F_F): 50 (specified overall), 45 (minimum local).
 - b. Floor Levelness Number (FL): 35 (specified overall), 30 (minimum local).

- D. Test Results:
 - 1. Report test results in writing to Owner, Contractor, and Architect within 24 hours after tests.
 - 2. Compare test results from tests performed before and after installation of polished concrete floor system.

3.05 PROTECTION

- A. Protect cast concrete from damage before polishing. Protect completed polished concrete floor system from damage until Substantial Completion.
 - 1. Do not allow vehicle and pedestrian traffic on unprotected floor.
 - 2. Do not allow construction materials, equipment, and tools on unprotected floor.
 - 3. Pipe cutting machines are strictly prohibited from placement/operation on the concrete.
 - 4. Steel shall not be placed on the slab to avoid rust stains.
 - 5. Acids and acid detergents shall not be used nor come in contact with the slab.
 - 6. Drop cloths must be utilized to prevent overspray or spillage.
 - 7. Contractor shall advise all trades that the slab must be protected at all times.
- B. Immediately remove mortar splatter, spilled liquids, oil, grease, paint, coatings, and other surface contaminants which could adversely affect completed polished concrete floor system.
- C. Repair damaged areas of completed polished concrete floor system to satisfaction of Architect.

3.06 SCHEDULES

- A. Reference finish schedules and floor finish plans in the drawings.

END OF SECTION

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SECTION 03600

GROUTING

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Cement grout.
 - 2. Cement mortar.
 - 3. Dry-pack mortar.
 - 4. Epoxy grout.
 - 5. Grout.
 - 6. Non-shrink epoxy grout.
 - 7. Non-shrink grout.

1.02 REFERENCES

- A. ASTM International (ASTM):
 - 1. C109 - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (using 2-inch cube specimens).
 - 2. C230 - Standard Specification for Flow Table for Use in Tests of Hydraulic Cement.
 - 3. C531 - Standard Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes.
 - 4. C579 - Standard Test Method for Compressive Strength of Chemical-Resistant Mortars, Grouts, and Monolithic Surfacing and Polymer Concretes.
 - 5. C939 - Standard Test Method for Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method).
 - 6. C942 - Standard Test Method for Compressive Strength of Grouts for Preplaced-Aggregate Concrete in the Laboratory.
 - 7. C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-shrink).
 - 8. C1181 - Standard Test Methods for Compressive Creep of Chemical-Resistant Polymer Machinery Grouts.
- B. International Concrete Repair Institute (ICRI):
 - 1. 310.2R - Selecting and specifying Concrete Surface Preparations for Sealers, Coatings, Polymer Overlays, and Concrete Repair.

1.03 SUBMITTALS

- A. Cement grout:
 - 1. Mix design.
 - 2. Material submittals.
- B. Cement mortar:
 - 1. Mix design.
 - 2. Material submittals.

- C. Non-shrink epoxy grout:
 - 1. Manufacturer's literature.
- D. Non-shrink grout:
 - 1. Manufacturer's literature.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to jobsite in their original, unopened packages or containers, clearly labeled with manufacturer's product identification and printed instructions.
- B. Store materials in cool dry place and in accordance with manufacturer's recommendations.
- C. Handle materials in accordance with the manufacturer's instructions.

PART 2 PRODUCTS

2.01 MANUFACTURED UNITS

- A. Non-shrink epoxy grout:
 - 1. Manufacturers: One of the following or equal:
 - a. Five Star Products, Inc., Five Star DP Epoxy Grout.
 - b. BASF Construction Chemicals, Masterflow 648 CP Plus.
 - c. L&M Construction Chemicals, Inc., EPOGROUT.
 - 2. Non-shrink epoxy grout shall be 100 percent solid, premeasured, prepackaged system containing 2-component thermosetting epoxy resin and inert aggregate.
 - 3. Maintain flowable consistency for at least 45 minutes at 70 degrees Fahrenheit.
 - 4. Shrinkage or expansion: Less than 0.0006 inches per inch when tested in accordance with ASTM C531.
 - 5. Minimum compressive strength: 10,000 pounds per square inch at 24 hours and 14,000 pounds per square inch at 7 days when tested in accordance with ASTM C579, Method B.
 - 6. Compressive creep: Not exceed 0.0037 inches/per inch when tested under 400 pounds per square inch constant load at 140 degrees Fahrenheit in accordance with ASTM C1181.
 - 7. Coefficient of thermal expansion: Not exceed 0.000018 inches per inch per degree Fahrenheit when tested in accordance with ASTM C531, Method B.
- B. Non-shrink grout:
 - 1. Manufacturers: One of the following or equal:
 - a. Five Star Products, Inc., Five Star Grout.
 - b. BASF Construction Chemicals, Masterflow 928.
 - c. L&M Construction Chemicals, Inc., CRYSTEX.
 - 2. In accordance with ASTM C1107.
 - 3. Preportioned and prepackaged cement-based mixture.
 - 4. Contain no metallic particles such as aluminum powder and no metallic aggregate such as iron filings.
 - 5. Require only addition of potable water.
 - 6. Water for pre-soaking, mixing, and curing: Potable water.

7. Free from emergence of mixing water from within or presence of water on its surface.
8. Remain at minimum flowable consistency for at least 45 minutes after mixing at 45 degrees Fahrenheit to 90 degrees Fahrenheit when tested in accordance with ASTM C230.
 - a. If at fluid consistency, verify consistency in accordance with ASTM C939.
9. Dimensional stability (height change):
 - a. In accordance with ASTM C1107, volume-adjusting Grade B or C at 45 degrees Fahrenheit to 90 degrees Fahrenheit.
 - b. Have 90 percent or greater bearing area under bases.
10. Have minimum compressive strengths at 45 degrees Fahrenheit to 90 degrees Fahrenheit in accordance with ASTM C1107 for various periods from time of placement, including 5,000 pounds per square inch at 28 days when tested in accordance with ASTM C109 as modified by ASTM C1107.

2.02 MIXES

- A. Cement grout:
 1. Use same sand-to-cementitious materials ratio for cement grout mix that is used for concrete mix.
 2. Use same materials for cement grout that are used for concrete.
 3. Use water-to-cementitious materials ratio that is no more than that specified for concrete.
 4. For spreading over surfaces of construction or cold joints.
- B. Cement mortar:
 1. Use same sand-to-cementitious materials ratio for cement mortar mix that is used for concrete mix.
 2. Use same materials for cement mortar that are used for concrete.
 3. Use water-to-cementitious materials ratio that is no more than that specified for concrete being repaired.
 4. At exposed concrete surfaces not to be painted or submerged in water: Use sufficient white cement to make color of finished patch match that of surrounding concrete.
- C. Dry-pack mortar:
 1. Proportions by weight: 1 part portland cement to 2 parts concrete sand.
 - a. Portland cement: As specified in Section SP403S – Concrete for Structures.
 - b. Concrete sand: As specified in Section SP403S – Concrete for Structures.
- D. Epoxy grout:
 1. Consist of mixture of epoxy or epoxy gel and sand.
 - a. Epoxy.
 - b. Epoxy gel.
 - c. Sand: Clean, bagged, graded, and kiln-dried silica sand.
 2. Proportioning:
 - a. For horizontal work: Consist of mixture of 1 part epoxy with not more than 2 parts sand.
 - b. For vertical or overhead work: Consist of 1 part epoxy gel with not more than 2 parts sand.

- E. Grout:
 - 1. Mix in proportions by weight: 1 part portland cement to 4 parts concrete sand.
 - a. Portland cement: As specified in Section SP403S – Concrete for Structures.
 - b. Concrete sand: As specified in Section SP403S – Concrete for Structures.
- F. Non-shrink epoxy grout:
 - 1. Mix in accordance with manufacturer's installation instructions.
- G. Non-shrink grout:
 - 1. Mix in accordance with manufacturer's installation instructions such that resulting mix has flowable consistency and is suitable for placing by pouring.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Inspect concrete surfaces to receive grout or mortar and verify that they are free of ice, frost, dirt, grease, oil, curing compounds, paints, impregnations, and loose material or foreign matter likely to reduce bond or performance of grout or mortar.

3.02 PREPARATION

- A. Surface preparation for grouting other baseplates:
 - 1. Remove grease, oil, dirt, dust, curing compounds, laitance, and other deleterious materials that may affect bond to concrete and bottoms of baseplates.
 - 2. Roughen concrete surfaces in contact with grout to ICRI CSP-6 surface profile or rougher.
 - a. Remove loose or broken concrete.
 - 3. Metal surfaces in contact with grout: Grit blast to white metal surface.

3.03 INSTALLATION

- A. Mixing:
 - 1. Cement grout:
 - a. Use mortar mixer with moving paddles.
 - b. Pre-wet mixer and empty out excess water before beginning mixing.
 - 2. Cement mortar:
 - a. Use mortar mixer with moving paddles.
 - b. Pre-wet mixer and empty out excess water before beginning mixing.
 - 3. Dry-patch mortar:
 - a. Use only enough water so that resulting mortar will crumble to touch after being formed into ball by hand.
 - 4. Non-shrink epoxy grout:
 - a. Keep temperature of non-shrink epoxy grout from exceeding manufacturer's recommendations.
 - 5. Non-shrink grout:
 - a. May be drypacked, flowed, or pumped into place. Do not overwork grout.
 - b. Do not retemper by adding more water after grout stiffens.

- B. Placement:
1. Cement grout:
 - a. Exercise care in placing cement grout because it is required to furnish structural strength, impermeable water seal, or both.
 - b. Do not use cement grout that has not been placed within 30 minutes after mixing.
 2. Cement mortar:
 - a. Use mortar mixer with moving paddles.
 - b. Pre-wet mixer and empty out excess water before beginning mixing.
 3. Epoxy grouts:
 - a. Wet surfaces with epoxy for horizontal work or epoxy gel for vertical or overhead work prior to placing epoxy grout.
 4. Non-shrink epoxy grout:
 - a. Mix in complete units. Do not vary ratio of components or add solvent to change consistency of mix.
 - b. Pour hardener into resin and mix for at least 1 minute and until mixture is uniform in color. Pour epoxy into mortar mixer wheelbarrow and add aggregate. Mix until aggregate is uniformly wetted. Over mixing will cause air entrapment in mix.
 5. Non-shrink grout:
 - a. Add non-shrink cement grout to premeasured amount of water that does not exceed the manufacturer's maximum recommended water content.
 - b. Mix in accordance with manufacturer's instructions to uniform consistency.
- C. Curing:
1. Cement based grouts and mortars:
 - a. Keep continuously wet for minimum of 7 days. Use wet burlap, soaker hose, sun shading, ponding, and in extreme conditions, combination of methods.
 - b. Maintain above 40 degrees Fahrenheit until it has attained compressive strength of 3,000 pounds per square inch, or above 70 degrees Fahrenheit for minimum of 24 hours to avoid damage from subsequent freezing.
 2. Epoxy based grouts:
 - a. Cure grouts in accordance with manufacturers' recommendations.
 - 1) Do not water cure epoxy grouts.
 - b. Do not allow any surface in contact with epoxy grout to fall below 50 degrees Fahrenheit for minimum of 48 hours after placement.
- D. Grouting equipment bases, baseplates, soleplates, and skids: As specified in Section 15050 - Common Work Results for Mechanical Equipment.
- E. Grouting other baseplates:
1. General:
 - a. Use non-shrink grout as specified in this Section.
 - b. Baseplate grouting shall take place from one side of baseplate to other in continuous flow of grout to avoid trapping air in grout.
 - c. Maintain hydrostatic head pressure by keeping level of grout in headbox above bottom of baseplate. Fill headbox to maximum level and work grout down.
 - d. Vibrate, rod, or chain non-shrink grout to facilitate grout flow, consolidate grout, and remove trapped air.

2. Forms and headboxes:
 - a. Build forms using material with adequate strength to withstand placement of grouts.
 - b. Use forms that are rigid and liquidtight. Caulk cracks and joints with elastomeric sealant.
 - c. Line forms with polyethylene for easy grout release. Coating forms with 2 coats of heavy-duty paste wax is also acceptable.
 - d. Headbox shall be 4 to 6 inches higher than baseplate and shall be located on one side of baseplate.
 - e. After grout sets, remove forms and trim back grout at 45 degree angle from bottom edges of baseplate.

3.04 FIELD QUALITY CONTROL

- A. Non-shrink epoxy grout:
 1. Test for 24-hour compressive strength in accordance with ASTM C579, Method B.
- B. Non-shrink grout:
 1. Test for 24-hour compressive strength in accordance with ASTM C942.

END OF SECTION

SECTION 04055

ADHESIVE BONDING REINFORCING BARS AND ALL THREAD RODS IN MASONRY

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Bonding reinforcing bars and all thread rods in masonry using injectable, 2-component adhesive.

1.02 REFERENCES

- A. American National Standards Institute (ANSI):
 - 1. Standard B212.15 - Carbide Tipped Masonry Drills and Blanks for Carbide Tipped Masonry Drills.
- B. ICC Evaluation Service, Inc. (ICC-ES):
 - 1. AC58 - Acceptance Criteria for Adhesive Anchors in Masonry Elements.
- C. Society for Protective Coatings (SSPC):
 - 1. Surface Preparation Standards (SP).
 - a. SP-1 - Solvent Cleaning.

1.03 DEFINITIONS

- A. Evaluation Report: Report prepared by ICC-ES, or by other testing agency acceptable to the Engineer and to the Authority Having Jurisdiction, that documents testing and review of the adhesive product to confirm that it conforms to the requirements of ICC-ES AC58.

1.04 SUBMITTALS

- A. Product data: Furnish technical data for adhesives, including:
 - 1. Independent testing laboratory results indicating allowable loads in tension and shear for masonry walls of the types included in the Work, with load modification factors for temperature, spacing, edge distance, and other installation variables.
 - 2. Handling and storage instructions.
 - 3. Installation instructions.
- B. Quality control submittals:
 - 1. Special inspection: Detailed instructions for special inspection to comply with the building code specified in Section 01410 - Regulatory Requirements.
 - 2. Evaluation Report confirming that the product complies with the requirements of ICC-ES AC58.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Store and protect as follows, unless manufacturer has more stringent requirements:
 - 1. Store adhesive components on pallets or shelving in a covered-storage area protected from weather.
 - 2. Control temperature to maintain storage within manufacturer's recommended temperature range.
 - a. If products are stored at temperatures outside manufacturer's recommended range, test components prior to use by methods acceptable to the Engineer to determine if the products still meet specified requirements.
 - 3. Dispose of products that have passed their expiration date.

1.06 PROJECT CONDITIONS

- A. Seismic design category: A.

PART 2 PRODUCTS

2.01 GENERAL

- A. Like items of materials: Use end products of one manufacturer to achieve structural compatibility and single-source responsibility.

2.02 ADHESIVE FOR SELF-CONTAINED CARTRIDGE SYSTEM

- A. Adhesive shall have a current Evaluation Report demonstrating compliance with the requirements of ICC-ES AC58.
- B. Materials:
 - 1. 2-component structural adhesive, insensitive to moisture, and gray in color.
 - 2. Cure temperature, pot life, and workability: Compatible with intended use and environmental conditions.
- C. Packaging:
 - 1. Furnished in disposable, side-by-side cartridges with resin and hardener components isolated until mixing through manufacturer's static mixing nozzle.
 - a. Nozzle designed to thoroughly blend the components, in the proper mixing ratio, for injection from the nozzle directly into prepared hole.
 - b. Provide nozzle extensions as required to allow full-depth insertion and filling from the bottom of the hole.
 - 2. Container markings: Include manufacturer's name, product name, batch number, mix ratio by volume, product expiration date, ANSI hazard classification, and appropriate ANSI handling precautions.
- D. For installation in solid masonry and solid-grouted masonry (concrete or brick):
 - 1. Manufacturers: One of the following or equal:
 - a. Hilti, Inc., HY-270 Adhesive Anchor System.
 - b. Simpson Strong-Tie Co., Inc., ET-HP Anchoring Adhesive.
 - c. USP Structural Connectors, CIA-GEL 7000 Masonry Epoxy Adhesive.

2.03 ALL THREAD RODS

- A. Materials: As specified in section SP720S – Metal for Structures.

2.04 REINFORCING BARS

- A. As specified in section SP406S – Reinforcing Steel.

PART 3 EXECUTION

3.01 GENERAL

- A. Unless otherwise required for “conditions of use” in the Evaluation Report submitted, prepare and install holes, adhesive, and inserts (all thread rods or reinforcing bars) in accordance with the manufacturer’s recommendations and this Section.
 - 1. In the event of conflicts, the more restrictive provisions shall govern.
- B. Do not install adhesive-bonded all-thread rods or reinforcing bars in upwardly inclined and overhead applications.

3.02 PREPARATION

- A. Prior to completing manufacturer’s on-site training specified in this Section, do not:
 - 1. Drill holes for reinforcing bars or all thread rods.
 - 2. Mix or install adhesive in holes.
- B. Review manufacturer’s installation instructions and “conditions of use” stipulated in the Evaluation Report before beginning work.
- C. Confirm that adhesive and substrate receiving adhesive are within manufacturer’s recommended temperature range, and will remain so during the cure time for the product.

3.03 HOLE LAYOUT AND INSTALLATION

- A. Drilling holes:
 - 1. Determine location of reinforcing bars or other obstructions with a non-destructive indicator device. Mark locations with on the surface of the masonry using removable construction crayon, or other method acceptable to the Engineer.
 - 2. Do not damage or cut existing reinforcing bars, electrical conduits, or other items embedded in the masonry without prior acceptance by Engineer.
- B. Hole drilling equipment:
 - 1. Electric or pneumatic rotary impact type.
 - a. Set drill to “rotation only” mode, or to “rotation plus hammer” mode in accordance with manufacturer’s installation instructions and the requirements of the Evaluation Report.
 - 2. Where edge distances are less than 2 inches and “rotation plus hammer” mode is permitted, use lighter impact equipment to prevent micro-cracking and spalling from drilling.

3. Drill bits: Carbide-tipped in accordance with ANSI B212-15.
 4. Hollow drill bits with flushing air systems are preferred. Air supplied to hollow drill bits shall be free of oil, water, or other contaminants that will reduce bond.
- C. Hole diameter: As recommend in the manufacturer's installation instructions and the Evaluation Report.
- D. Hole depth: As recommended by the manufacturer's installation instructions to provide minimum effective embedment indicated on the Drawings.
- E. Obstructions in drill path:
1. If an existing reinforcing bar or other obstruction is hit while drilling hole, stop drilling and fill the hole with dry-pack mortar. Relocate the hole to miss the obstruction and drill to the required depth.
 - a. Allow dry-pack mortar to cure to strength equal to that of the surrounding masonry before resuming drilling in that area.
 - b. Epoxy grout may be substituted for dry-pack mortar when acceptable to the Engineer.
 2. Avoid drilling an excessive number of adjacent holes that would weaken the structural member and endanger the stability of the structure. Obtain Engineer's acceptance of distance between abandoned and relocated holes.
 3. When existing reinforcing steel is encountered during drilling and when acceptable to Engineer, enlarge the hole by 1/8 inch, core through the existing reinforcing steel at the larger diameter, and resume drilling at original hole diameter.
 4. Bent bar reinforcing bars: Where edge distances are critical and interference with existing reinforcing steel is likely, and if acceptable to Engineer, drill hole at 10 degree angle (or less) from axis of reinforcing bar or all thread rod being installed.
- F. Cleaning holes:
1. Insert air nozzle to bottom of hole and blow out loose dust.
 - a. Use compressed air that is free of oil, water, or other contaminants.
 - b. Provide minimum air pressure of 90 pounds per square inch for not less than 4 seconds.
 2. Using a stiff bristle brush of diameter that provides contact around the full perimeter of the hole, vigorously brush the hole to dislodge compacted drilling dust.
 - a. Insert brush to the bottom of the hole and withdraw using a simultaneous twisting motion.
 - b. Repeat at least 4 times.
 3. Repeat the preceding steps as required to remove drilling dust or other material that will reduce bond, and as required by the manufacturer and the Evaluation Report.
 4. Leave prepared hole clean and dry.

3.04 INSTALLATION OF ADHESIVE AND INSERTS

- A. Clean and prepare inserts:
1. Prepare embedded length of reinforcing bars and all thread rods by cleaning to bare metal. The inserts shall be free of oil, grease, paint, dirt, mill scale, rust, or other coatings that will reduce bond.

2. Solvent-clean prepared reinforcing bars and all thread rods over their embedment length in accordance with SSPC SP-1. Provide an oil and grease-free surface for bonding of adhesive to steel.
- B. Fill holes with adhesive: Solid or solid-grouted masonry:
1. Starting at the bottom of the hole, fill hole with adhesive before inserting the reinforcing bar or all thread rod.
 2. Fill hole without creating air voids as nozzle is withdrawn.
 3. Fill hole with sufficient adhesive so that excess is extruded out of the hole when the reinforcing bar or all thread rod is inserted into the hole.
 4. Where metal or plastic screens are required for use in masonry (units with hollow cells or holes, and multi-wythe brick walls), fill screen with adhesive and insert into hole in accordance with manufacturer's recommendations.
- C. Fill holes with adhesive: Masonry with holes or un-grouted cells.
1. Provide manufacturer's mesh screen tubes (steel or plastic mesh), fill with adhesive, and install in compliance with manufacturer's instructions.
- D. Install reinforcing bars and all thread rods:
1. Install to depth, spacing, and locations as indicated on the Drawings.
 2. Insert bars and all thread rods into hole in accordance with manufacturer's recommended procedures. Confirm that insert has reached the designated embedment in the hole and that adhesive completely surrounds the embedded portion.
 3. Clean excess adhesive from the mouth of the hole.
- E. Curing and loading:
1. Provide curing conditions recommended by the adhesive manufacturer for the period required to fully cure the adhesive at the actual temperature of the masonry.
 2. Do not disturb or load anchors until manufacturer's recommended cure time has elapsed.

3.05 FIELD QUALITY CONTROL

- A. Contractor shall provide field quality control as specified.
- B. Manufacturers' services:
1. Before beginning installation, furnish adhesive manufacturer's representative to conduct on-site training in proper storage and handling of adhesive, drilling and cleaning of holes, and preparation and installation of reinforcing bars and all thread rods.
 - a. Provide notice of training to Engineer and Special Inspector not less than 10 working days before training occurs. Engineer and Special Inspector may attend training sessions.
 2. Submit record, signed by the Engineer, listing Contractor's personnel who completed the training. Only qualified personnel who have completed manufacturer's on-site training shall perform installations.
 3. Do not install holes or adhesive until training is complete.

3.06 FIELD QUALITY ASSURANCE

- A. Owner will provide on-site inspection and field quality assurance.
- B. Special inspection:
 - 1. As specified in Section 01455 - Regulatory Quality Assurance.
 - 2. Unless otherwise indicated on the Drawings or in this Section, provide periodic special inspection as required by the "Conditions of Use" in the Evaluation Report for the product installed.
 - 3. Provide a written record of each inspection using form acceptable to the Engineer and the Authority Having Jurisdiction.
 - 4. Preparation:
 - a. Review drawings and specifications for the Work being observed.
 - b. Review adhesive manufacturer's recommended installation and evaluation report's special inspection procedures.
 - 5. Provide an initial inspection by for each combination of masonry type and reinforcing bar or all thread rod being installed. During initial inspection, observe the following for compliance with installation requirements. Furnish report of inspection that includes the following items.
 - a. Masonry construction: Type and thickness; whether fully or partially grouted; locations and types of voids and holes in units.
 - b. Environment: Temperature and moisture conditions of masonry base material and work area.
 - c. Holes: Locations, spacing, edge distances; verification of drill bit compliance with ANSI B212.15; cleaning equipment and procedures; cleanliness of hole. Before placing adhesive, confirm that depth and preparation of holes conforms to requirements of the Contract Documents, installation recommendations of the manufacturer, and "conditions of use" specified in the Evaluation Report.
 - d. Adhesive: Product manufacturer and name; lot number and expiration date; temperature of product at installation; installation procedures. Note initial set times observed during installation.
 - e. Embedded reinforcing bars and all thread rods: Material diameter and length; steel grade and/or strength; cleaning and preparation; cleanliness at insertion; minimum effective embedment.
 - 6. Subsequent installations of the same reinforcing bars or threaded rods in the same masonry may be performed without the presence of the special inspector, provided that:
 - a. There is no change in the personnel performing the installation, the type or details of the masonry receiving the insert, the adhesive or the reinforcing bars and all thread rods being used. Changes in any of these items shall require a new initial inspection.
 - b. For ongoing installations over a period of time, the special inspector visits the site at least once per day during each day of installation to observe the work for compliance with material requirements and installation procedures.

END OF SECTION

SECTION 04220

CONCRETE MASONRY UNITS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Concrete masonry units.
 - 2. Cast stone caps.
 - 3. Reinforcement, anchorage and accessories.

1.02 REFERENCES

- A. American Concrete Institute (ACI):
 - 1. ACI 530.1 - Specification for Masonry Structures.
- B. ASTM International (ASTM):
 - 1. C90 - Standard Specification for Loadbearing Concrete Masonry Units.
 - 2. C140 - Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.
 - 3. C426 - Standard Test Method for Linear Drying Shrinkage of Concrete Masonry Units.

1.03 DEFINITIONS

- A. Standard Level of Quality: High quality, but conventional, nearly free of chips, cracks, or other imperfections detracting from appearance when discernible and identified from distance of 20 feet under diffused lighting. When level of quality is not specified, Standard Level of Quality shall be assumed.
- B. Mortar Smears: Mortar paste smeared across the permanent masonry construction during construction and absorbed into the masonry pores.
- C. Mortar Splash: Mortar dropped splashed onto the permanent masonry construction at the base of the wall or off the scaffolding.
- D. Mortar Tag: Excess mortar between masonry units worked out of the joints during tooling or striking.
- E. Mortar Stains: Mortar paste left after mortar tags are removed.

1.04 SUBMITTALS

- A. Product data:
 - 1. Submit manufacturer's product data for split face block.
 - 2. Submit manufacturers' product data for proposed cleaning agent.

- B. Shop drawings: Include elevations of each wall indicating type and layout of units, including type of mortar joints, bond pattern, reinforcing steel, connecting dowels, joint reinforcement, grouted cells, and control joints.
- C. Samples:
 - 1. Concrete Masonry Units
 - a. Include samples of stretcher units in sufficient quantity to illustrate color and finish range.
 - 2. Cast Stone Caps:
 - a. Submit two samples illustrating color range and texture, markings and surface finish
- D. Shop Drawings:
 - 1. Cast Stone & Masonry Units: Indicate sizes, profiles, coursing, and locations of special shapes.
 - 2. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement." Include wall elevations indicating size and location of reinforcing, and length and location of reinforcing bar laps.
 - 3. Fabricating Flashing: Detail corner units, end dam units, and other special conditions for fabricated flashings
- E. Test reports:
 - 1. Compressive strength.
 - 2. Linear shrinkage.
 - 3. Moisture content as a percentage of total absorption.
 - 4. Total absorption.
 - 5. Unit weight.
- F. Manufacturer's instructions:
 - 1. Submit printed or written recommendations from the masonry unit manufacturer of the cleaning procedures and cleaning agents appropriate for each type of masonry unit included in the work.
- G. Quality assurance submittals:
 - 1. If requested by the Engineer, submit a record of the Installer's evidence of qualifications.
 - 2. If requested by the Engineer, submit a record of the Masonry Cleaner's evidence of qualifications.

1.05 SUSTAINABLE DESIGN SUBMITTALS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify that products meet or exceed specified sustainable design requirements.
 - 1. Materials Resources Certificates:
 - a. Certify recycled material content for recycled content products.

1.06 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Installer qualifications:
 - a. The mason shall hold an appropriate contractor's license in the State where the work will be constructed.
 - b. The mason shall have not less than 5 years experience and completed a minimum of 20 projects and at least 5 of which included the type of masonry units specified for this Work.
 - c. The mason shall hold current certification demonstrating successful completion of the quality certification program administered by the Rocky Mountain Masonry Institute or the Mason Contractors Association of America.
 - 2. Masonry cleaner qualifications:
 - a. The masonry cleaner shall have not less than 5 years experience and completed a minimum of 20 projects and at least 5 of which included the type of masonry units specified for this Work.
- B. Mock-up:
 - 1. A minimum 2 weeks to starting construction of masonry, construct minimum 4 foot inches by 4 foot inches square mock-up. The mock-up shall be constructed by the mason who will be performing the Work.
 - 2. Mock-up is intended for use as the project standard of workmanship, construction, quality, appearance, and material selection.
 - 3. Use accepted materials containing each different kind and color of concrete masonry units to illustrate wall design.
 - 4. The mock-up shall be constructed by the mason who will be performing the work.
 - 5. The mock-up shall be cleaned with the exact equipment, products, and methods submitted and cleaned by the individual who will perform the Work.
 - 6. When accepted, mock-up will be standard of comparison for remainder of masonry work.
 - a. The mock-up may be accepted by the Engineer with exceptions that will not be accepted in the final construction.
 - 1) In such cases, those areas of the mock-up not accepted will be clearly identified by the Engineer.
 - 7. When not accepted by the Engineer, construct another mock-up.
 - 8. Upon completion of Project, dispose of mock-ups in legal manner at offsite location.
- C. Pre-installation conference: Conduct as specified in Section 01400 – Quality Control Services.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Transport and handle concrete masonry units as required to prevent discoloration, chipping, and breakage.
- B. Store masonry units off the ground in a dry location, covered and protected from absorbing moisture.
 - 1. Locate storage piles, stacks, and bins to protect materials from heavy traffic.

2. If masonry units are delivered in shrink-wrapped packaging and condensation develops, remove shrink-wrap packaging.
- C. Remove chipped, cracked, and otherwise defective units from jobsite upon discovery.

1.08 ENVIRONMENTAL REQUIREMENTS

- A. Cold weather requirements:
1. In accordance with building code as specified in Section 01600 – Product Requirements, provide adequate equipment for heating masonry materials when air temperature is below 40 degrees Fahrenheit.
- B. Hot weather requirements:
1. In accordance with building code as specified in Section 01600 - Product Requirements, when ambient air temperature exceeds 100 degrees Fahrenheit, or when ambient air temperature exceeds 90 degrees Fahrenheit and wind velocity is greater than 8 miles per hour, implement hot weather protection procedures.
 2. Wet mortarboard before loading and cover mortar to retard drying when not being used.
 3. Do not spread mortar beds more than 48 inches ahead of placing masonry units.
 4. Place masonry units within one minute of spreading mortar.

1.09 SEQUENCING AND SCHEDULING

- A. Order concrete masonry units well before start of installation to ensure adequate time for manufacturing and minimum 28 days for curing and drying before start of installation. Protect from weather after curing period to avoid moisture increase.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Concrete Masonry Units:
1. Best Block, a Quikcrete Company.
 2. Texas Building Products.
 3. Or approved equal.
- B. Cast Stone Manufacturers:
1. Qualified Architectural Pre-cast Concrete unit fabricators.

2.02 MANUFACTURED UNITS

- A. Hollow load bearing concrete masonry units:
1. Class: Class 1 in accordance with ASTM C90, Standard Level of Quality with minimum compressive strength of 1,900 pounds per square inch.
 2. Surface texture: Standard and polished/burnished face with dense faces suitable for painting where scheduled to be painted.
 3. Color: Integral, and coordinate with Owner.

4. Typical size: 12 inches wide by 8 inches high by 16 inches long, unless otherwise indicated on the Drawings, or other sizes as needed to minimize cutting.
 5. Other sizes: 4 inches wide by 8 inches high by 16 inches long; 8 inches wide by 8 inches high by 16 inches long.
 6. Special sizes and shapes: As required for window and door openings, bond beams, piers, lintels, control joints, and other special applications to minimize cutting.
- B. Control joint filler: The key shall be of the width and shape as indicated on the Drawings. In accordance with ASTM D 2000 or ASTM D 2287:
1. Manufacturers: one of the following or equal:
 - a. Hohmann and Barnard, VS Standard - PVC Control Joint.
- C. Cast Stone:
1. Cement: ASTM C150, Type I: limestone color for Sills, Base starter course with the exception of the downspout splash pad which can be natural gray.
 2. Concrete Materials: ASTM C33-Concrete aggregate with a max. size of 1/2 inch (limestone aggregate for all except splash pads); water and sand.
 3. Reinforcing Steel: ASTM A615, deformed steel bars ASTM A185, welded steel wire fabric; Class 2 strength and size commensurate with precast unit design.
 4. Mortar Admixtures (For precast concrete units used at exterior applications only.): Liquid polymeric admixture of water repellent - Dry Block System. (Use per Dry-Block System Recommendations.) as manufactured by W.R. Grace or approved equal.
 5. Surface Finish Aggregate: Clean, smooth natural limestone color, from single source throughout conforming to ASTM C33.
 6. Grout: Per Section 04100 - Mortar and Masonry Grout.
 7. Forms: As required to produce Architectural Precast concrete to match existing conditions and as detailed at new construction.
 8. Mix:
 - a. Concrete: Minimum 5000 psi, 28 day strength, air entrained to 5 to 7 percent in accordance with ACI 301.
- D. Anchor bolts: As specified in Section 720S.
- E. Steel reinforcement: As specified in Section 406S.
- F. Wall ties
1. Wall Ties: 0.148 inch diameter, eye and pintle type; ASTM A153/A153M hot dip galvanized, appropriate companion piece to multi-wythe joint reinforcement.
 2. Wall Ties for use only at (90) Administration Building to tie masonry back to building columns: 3/16 inch diameter, adjustable; ASTM A153/A153M hot dip galvanized, with 5/16 inch diameter weld on wire column anchor.
- G. Wire joint reinforcement
1. Single Wythe Joint Reinforcement: ASTM A951/A951M; 0.148 inch diameter side rods with 0.148 inch diameter cross ties; hot dip galvanized.
- H. Weeps for masonry wall
1. Manufacturers: one of the following or equal:
 - a. Hohmann and Barnard, .375 inch diameter Plastic Model 341W with wick.

- I. Foamed-in-place insulation: As specified in Section 07214.
- J. Through wall flashing: Polymer modified asphalt-coated copper sheet.
 - 1. Manufacturers: One of the following, or equal:
 - a. Hohmann and Barnard, C-Coat™ Flashing with Stainless Steel Surface Mount Termination Bar.
 - 2. Installed with vertical face 8 inches high minimum.
- K. Single Wythe Concrete Masonry Drainage System: stainless steel drainage strip and vertical mesh sleeve to allow moisture to drain out of single wythe system.
 - 1. Mortar Net, Inc. Gary IN; #BN120 CMU Drainage System including the following:
 - a. Drainage Strip: BN 121, 28 ga stainless steel with formed drip edge on the face edge and drainage mesh factory attached.
 - b. Vertical Mesh Sleeve: BN 122, 7x7x7x3/8 inch thick polyester mesh.
 - c. Sealant as approved by manufacturer.
- L. Masonry Drainage and Flashing System: system includes flashing, cavity wall drainage, drip edge, termination bar and weeps.
 - 1. Manufacturers: the following or equal:
 - a. Mortar Net, Inc., Gary IN; Total Flash System including the following:
 - 1) Flashing Membrane: Hyload 40 mil polymeric, reinforced, UV stable membrane with DupPant's Elvaloy KEE polymer.
 - 2) Mortar Collection Device/Weep Tabs: Recycled polyester material impregnated with UV protection, biocide to resist mold and flame retardant; woven mesh designed to allow moisture to migrate to the integrated weep tabs; product adhered to flashing.
 - 3) Drip edge: 304 stainless steel drip edge pre-attached to flashing membrane with formed drip edge.
 - 4) Adhesive: as recommended by manufacturer.
 - 5) Termination bar: high strength corrosion resistant plastic strip with pre-drilled holes spaced at 6 inches.
 - 6) Screws: as recommended by manufacturer.

2.03 SUSTAINABILITY CHARACTERISTICS

- A. Section 01352 - Sustainable Construction Requirements: Requirements for sustainable design compliance.
- B. Materials and Resources Characteristics:
 - 1. Recycled Content Materials: Furnish materials with maximum available recycled content.

PART 3 EXECUTION

3.01 PREPARATION

- A. Protection:
 - 1. Protect adjacent construction with appropriate means from mortar droppings and other effects of laying of concrete masonry units.
- B. Surface preparation:
 - 1. Thoroughly clean foundations of laitance, grease, oil, mud, dirt, mortar droppings, and other matter that will reduce bond.

3.02 INSTALLATION

- A. Forms and shores:
 - 1. Where required, construct forms to the shapes indicated on the Drawings:
 - a. Construct forms sufficiently rigid to prevent deflection which may result in cracking or other damage to supported masonry and sufficiently tight to prevent leakage of mortar and grout.
 - b. Do not remove supporting forms or shores until the supported masonry has acquired sufficient strength to support safely its weight and any construction loads to which it may be subjected.
 - 1) Wait at least 24 hours after grouting masonry columns or walls before applying uniform loads.
 - 2. Wait at least 72 hours before applying concentrated loads.
- B. Concrete masonry units:
 - 1. Provide Standard Level of Quality. Comply with the requirements of ACI 530.1 unless more restrictive requirements are contained in this Section.
 - 2. Lay concrete masonry units dry.
 - 3. Lay units in uniform and true courses, level, plumb, and without projections or offset of adjacent units.
 - 4. Lay units to preserve unobstructed vertical continuity of cells to be filled with grout or insulation.
 - 5. Align vertical cells to be filled with grout to maintain clear, unobstructed continuous vertical cell measuring not less than 2 by 3 inches.
 - 6. Place mortar with full coverage of joints at webs of all cells and face shells.
 - 7. Butter vertical head joints for thickness equal to face shell thickness of units, and shove joints tightly together so that mortar bonds to both masonry units.
 - 8. Solidly fill joints from face of units to inside face of cells.
 - 9. Lay units to desired height with joints of uniform thickness.
 - 10. Bond shall be plumb throughout.
 - 11. Lay units to avoid formation of cracks when units are placed. Keep cells of units as free of mortar as possible as masonry wall height increases.
 - 12. When positions of units shift after mortar has stiffened, bond is broken, or cracks are formed, relay units in new mortar.
 - 13. Remove mortar, mortar droppings, debris, and other obstructions and materials from inside of cell walls
 - 14. Remove mortar tags and smears daily with a non-metallic tool.
 - a. Mortar tags and smears shall be removed after they initially set, but shall not be permitted to remain more than 24 hours.

15. Where practical, protect completed work from mortar splash by placing thin plastic sheeting around the base of walls.
 - a. Place sand, straw, sawdust or other similar material on the floor around the base of walls to protect floors and walls.
 16. Turn scaffold planks over at the end of the workday to avoid mortar splashes from wet weather.
 - a. Cover tops of walls at the end of the workday and other work stoppages to prevent entry of water into the partially completed masonry.
 17. Seal cleanouts after inspection and before grouting
- C. Bond pattern:
1. Lay concrete masonry units in running bond pattern, unless otherwise indicated on the Drawings.
- D. Mortar joints:
1. Make joints straight, clean, smooth, and uniform in thickness.
 2. Tool exposed joints, slightly concave Strike concealed joints flush.
 3. Make vertical and horizontal joints 3/8-inch thick.
 4. Where fresh masonry joins totally or partially set masonry, clean and roughen set masonry before laying new units.
 5. Remove mortar that protrudes more than 1/2 inch into the cells of units that are to be grouted.
- E. Grouting and reinforcement:
1. Where horizontal and vertical bars are spliced and adjacent lap splices are separated by more than 3 inches, the lap splice length shall be 72 bar diameters. Where adjacent lap splices are separated by 3 inches or less, the lap splice length shall be increased by 1.3 times or the lap splices shall be staggered at least 24 bar diameters with no increase in length.
 2. Hold vertical reinforcing bars in position at top and bottom and at intervals not exceeding 200 bar diameters. Use steel wire bar positioners to position bars. Tie reinforcing bars to dowels with wire ties.
 3. Obtain acceptance of reinforcement placement before grouting.
 4. Fill all spaces and cells solidly with grout
 - a. Low-lift grouting:
 - 1) Hollow unit masonry to be grouted by the low lift method shall be constructed and grouted in lifts not exceeding 4feet.
 - 2) Slushing with mortar will not be permitted.
 - b. High-lift grouting:
 - 1) If grouting is accomplished by the high-lift method, double wythe masonry shall be allowed to cure at least 72 hours.
 - 2) Hollow unit masonry shall be allowed to cure at least 24 hours before grouting.
 - 3) Grout shall be placed in lifts not to exceed 6 feet in depth.
 - 4) Each lift shall be allowed to set for 10 minutes after initial consolidation of grout before successive lift is placed.
 - 5) The full height of each section of wall shall be grouted in 1 day.
 5. Grout in cells shall have full contact with surface of concrete footings.
 6. When grouting stops for 1 hour or longer, form horizontal construction joints by stopping grout placement 1-1/2 inches below top of uppermost unit containing grout.

7. After placement, consolidate grout using mechanical immersion vibrators designed for consolidating grout.
8. Placement:
 - a. Use a hand bucket, concrete hopper, or grout pump.
 - b. Place grout in final position within 1-1/2 hours after mixing. Place grout so as to completely fill the grout spaces without segregation of the aggregates.
 - c. Do not insert vibrators into lower grout placements that are in a semi-solidified state.
 - d. Remove grout spills immediately by hand washing with a bucket and brush.
- F. Installation – Cast Stone:
 1. Erect units without damage to shape or finish. Replace damaged units.
 2. Erect units level and plumb within allowable tolerances.
 3. Align and maintain uniform horizontal and vertical joints as erection progresses
- G. Weeps shall slope to outside. The wick shall be extended into the gap between the brick and water resistant layer to move moisture into the weep.
- H. Install Flashing and termination bars as recommended by the Manufacturer.
- I. Cutting concrete masonry units:
 1. When possible, use full units of the proper size in lieu of cut units. Cut units as required to form chases, openings, for anchorage, and for other appurtenances.
 2. Cut and fit units with power-driven carborundum or diamond disc blade saw.
- J. Control joints:
 1. Provide in masonry walls at locations indicated on the Drawings.
 2. Make full height and continuous in appearance.
 3. Run bond beams and bond beam reinforcing bars continuously through control joints.
 4. Insert control joint filler in joints as wall is constructed.
 5. Apply sealant as specified in Section 07900.
- K. Steel door frames:
 1. Anchor and fully grout jambs and head of steel doorframes connected to concrete unit masonry.
 2. Fill frames with grout as each 2 feet of concrete unit masonry is laid.
- L. Anchor bolts:
 1. Hold anchor bolts in place with template during grouting to assure precise alignment.
 2. Do not cut or ream members being anchored or use other means to accommodate misaligned anchor bolts in roof deck support angles.
- M. Enclosures:
 1. Where concrete masonry units enclose conduit, pipes, stacks, ducts, and similar items, construct chases, cavities, and similar spaces as required, whether or not such spaces are indicated on the Drawings.
 2. Point openings around flush mounted electrical outlet boxes with mortar, including flush joints above boxes.

3. Do not cover enclosures until inspected and when appropriate, tested.
- N. Other embedded items:
1. Build in wall plugs, accessories, flashings, pipe sleeves, and other items required to be built-in as the masonry work progresses.
- O. Patching:
1. Patch exposed concrete masonry units at completion of the Work and in such manner that patching will be indistinguishable from similar surroundings and adjoining construction.
- P. Water curing:
1. Protect concrete masonry units from drying too rapidly by frequently fogging or sprinkling so walls will always be visibly damp for minimum 3 days.
- Q. Miscellaneous:
1. Build in required items, such as anchors, flashings, sleeves, frames, structural steel, lintels, anchor bolts, and metal fabrications, as required for complete installation.
- R. Sealing Polished Face Concrete Masonry Units:
1. After erection of wall, clean masonry units and indicated this specification and manufacturer's recommendations. Allow walls to dry thoroughly.
 2. Apply two coats of sealant by airless sprayer. Follow sealant manufacturer's instructions for application.
- S. Grouting equipment:
1. Grout pumps:
 - a. Do not pump grout through aluminum tubes.
 - b. Operate pumps to produce a continuous stream of grout without air pockets.
 - c. Upon completion of each days pumping, eject grout from pipeline without contamination or segregation of the grout:
 - 1) Remove waste materials and debris from the equipment.
 - 2) Dispose of waste materials, debris, and all flushing water outside the masonry.
 2. Vibrators:
 - a. Internal vibrators shall maintain a speed of not less than 5,000 impulses per minute when submerged in the grout.
 - b. Maintain at least 1 spare vibrator, at the site at all times.
 - c. Apply vibrators at uniformly spaced points not further apart than the visible effectiveness of the machine.
 - d. Limit duration of vibration to time necessary to produce satisfactory consolidation without causing segregation.

3.03 CONSTRUCTION

- A. Site tolerances: Lay masonry plumb, true to line, and with courses level. Keep bond pattern plumb throughout. Lay masonry within the following tolerances:
1. Maximum variation from the plumb in the lines and surfaces of columns, walls, and in the flutes and surfaces of fluted or split faced blocks:
 - a. In adjacent masonry units: 1/8 inch.
 - b. In 10 feet: 1/4 inch.
 - c. In any story or 20 feet maximum: 3/8 inch.
 - d. In 40 feet or more: 1/2 inch.
 2. Maximum variations from the plumb for external corners, expansion joints, and other conspicuous lines:
 - a. In any story or 20 feet maximum: 1/4 inch.
 - b. In 40 feet or more: 1/2 inch.
 3. Maximum variations from the level or grades indicated on the Drawings for exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines:
 - a. In any bay or 20 feet maximum: 1/4 inch.
 - b. In 40 feet or more: 1/2 inch.
 4. Maximum variations of the linear building lines from established position in plan and related portion of columns, walls, and partitions:
 - a. In any bay or 20 feet maximum: 1/2 inch.
 - b. In 40 feet or more: 3/4 inch.
 5. Maximum variation in cross sectional dimensions of columns and in thickness of walls:
 - a. Minus: 1/4 inch.
 - b. Plus: 1/2 inch.

3.04 FIELD QUALITY CONTROL

- A. Site tests:
1. Owner will have tests performed by an independent laboratory.
 2. Have minimum 3 concrete masonry units of each type proposed for Project tested in accordance with ASTM C90, C140, and C426 to verify conformance to Specifications.
 3. Tests shall include compressive strength, linear shrinkage, moisture content as percent of total absorption, total absorption, and unit weight.
- B. Special inspection:
1. Special inspection shall be as specified in Section 01455.
 2. Owner will employ a qualified masonry special inspector for continuous special inspection of the masonry work. Acceptance by a state or municipality having a program of examining and certifying masonry inspectors will be considered adequate qualifications. The masonry inspector shall be at the site during all masonry construction and perform the following duties:
 - a. Review Drawings and Specifications and meet with the Contractor to discuss requirements before work commences.
 - b. Before masonry work commences, Contractor and the Contractor's Quality Control Representative shall attend meeting with Engineer to review the requirements for surveillance and quality control of the masonry work.
 - c. Check brand and type of cement, lime (if used), and source of sand.

- d. Verify that foundation is clean, rough, and ready to receive units.
 - e. Check reinforcing steel dowels for correct location, straightness, proper alignment, spacing, size, and length.
 - f. Observe field proportioning of mortar. Visually check aggregate to determine uniformity of grading, cleanliness, and moisture.
 - g. Verify that joints are full of mortar and kept tight during work. Inspect grout cells to verify that fins will not interfere with grouting. Verify that masons keep grout cells clean of mortar droppings and inspect to determine compliance.
 - h. Continuously observe placing of grout.
 - i. Perform or supervise performance of required sampling and testing.
3. Keep complete record of inspections. Report daily to the Building Official, Contractor's Quality Control Representative, Engineer, and Owner the progress of the masonry inspection.

3.05 FINAL CLEANING

A. General:

1. Final cleaning shall be performed within 7 to 14 days after construction of masonry work.
2. Protect adjacent materials and equipment that may be damaged by cleaning.
3. Pre-wet masonry before applying cleaning agent, but do not saturate masonry.
4. Remove mortar stains, smears, and splash, efflorescence, and grout stains on exposed surfaces with the submitted cleaning agent as directed by the masonry unit manufacturer's recommendations.
5. Do not use muriatic acid as cleaning agent.
6. Cleaning agents shall be applied when the masonry surface and air temperatures are at least 50 degrees Fahrenheit.
 - a. Dilute cleaning agents in accordance with manufacturer's recommendations.
 - b. Do not allow cleaning agents to dry on the masonry.
7. Clean wall from the top to the bottom, without overlapping areas being cleaned for consistency.
8. If pressure cleaning equipment is used, the following limitations shall be observed:
 - a. Apply cleaning agent to pre-wetted wall with low pressure (less than 50 pounds per square inch).
 - b. Use a 25° to 50° flared-tip nozzle (not a pointed tip).
 - c. Maintain a consistent distance from the spray nozzle to the masonry surface no closer than 12 inches.
 - 1) Masonry cleaner shall use a combination of pressure, nozzle, and distance from tip to masonry that does not damage the masonry surface.
9. Rinse cleaning agents off the wall with potable water.
10. Dispose of debris, refuse, and surplus material offsite legally.

3.06 PROTECTION

- A. Provide temporary protection for exposed masonry corners subject to damage.
- B. Bracing:
 - 1. Unless wall is adequately supported by permanent supporting elements so wall will not overturn or collapse, adequately brace masonry walls over 8 feet in height to prevent overturning and to prevent collapse.
 - 2. Keep bracing in place until permanent supporting elements of structure are in place.
- C. Limited access zone:
 - 1. Establish limited access zone prior to start of masonry wall construction.
 - 2. Zone shall be immediately adjacent to wall and equal to height of wall to be constructed plus 4 feet by entire length of wall on unscaffolded side of wall.
 - 3. Limit access to zone to workers actively engaged in constructing wall. Do not permit other persons to enter zone.
- D. Keep zone in place until wall is adequately supported or braced by permanent supporting elements to prevent overturning and collapse.

3.07 SCHEDULES

- A. Substation #1 (85) Exterior Wall: Composite masonry with exterior wythe of polished exterior face CMU wainscot with cast stone cap, bonded with wire ties to back-up wall of standard gray load bearing concrete block masonry (CMU) across a 4 inch space for 2" of insulation and a 2" air gap.
- B. Substation #1 (85) Interior Wall: Standard gray concrete block masonry (CMU) with a 2" CMU soap cap.
- C. Administration Building (90) Exterior wall: Single wythe of fully insulated CMU wainscot, both faces polished, with cast stone cap.

END OF SECTION

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SECTION 05140
STRUCTURAL ALUMINUM

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Structural aluminum products, including sheet, pipe, extrusions, and associated accessories.

1.02 REFERENCES

- A. ASTM International (ASTM):
1. B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 2. B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
 3. B308 - Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles.
- B. American Welding Society (AWS):
1. A5.10 - Specification for Bare Aluminum and Aluminum-Alloy Welding Electrodes and Rods.
 2. D1.2 - Structural Welding Code - Aluminum.

1.03 SUBMITTALS

- A. Quality control submittals:
1. Test Reports: Certified copies of mill tests or reports from a recognized commercial laboratory including chemical and tensile properties of each shipment of structural metal or part thereof having common properties. Tests and analyses shall be made in accordance with applicable ASTM Standards.
 2. Welder's certificates.

1.04 QUALITY ASSURANCE

- A. Qualifications:
1. Perform welding of structural metals with welders who have current AWS certificate for the type of welding to be performed.
 2. Notify Engineer 24 hours minimum before starting shop or field welding.
 3. Engineer may check materials, equipment, and qualifications of welders.
 4. Remove welders performing unsatisfactory work, or require to requalify.
 5. Engineer may use gamma ray, magnetic particle dye penetrant, or other aids to visual inspection to examine any part of welds or all welds.
 6. Contractor shall bear costs of retests on defective welds.
 7. Contractor shall bear costs in connection with qualifying welders.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Structural sheet aluminum: ASTM B209, Alloy 6061-T6.
- B. Structural aluminum: ASTM B308, Alloy 6061-T6.
- C. Extruded aluminum: ASTM B221, Alloy 6063-T42.
- D. Isolating sleeves and washers:
 - 1. As indicated on the Drawings and as specified in Section 05190 - Mechanical Anchoring and Fastening to Concrete and Masonry.
- E. Miscellaneous materials:
 - 1. Furnish supplementary parts necessary to complete each item even where such work is neither definitely indicated on the Drawings nor specified.
 - 2. Size, form, attachment, and location shall conform to the best of current practice.
 - 3. Conform to applicable ASTM Standards for materials not otherwise specified.

2.02 FABRICATION

- A. Aluminum layout:
 - 1. Center punch hole centers, and punch or scribe cutoff lines, except where marks would remain on fabricated material.
 - 2. Apply temperature correction where necessary in layout of critical dimensions. Use a coefficient of expansion of 0.000013 per degree of Fahrenheit.
- B. Cutting aluminum:
 - 1. Material 1/2-inch thick or less: Shear, saw, or cut with a router.
 - 2. Material more than 1/2-inch thick: Saw or rout.
 - 3. Make cut edges true and smooth, free from excessive burrs or ragged breaks.
 - 4. Avoid reentrant cuts wherever possible. Where used, fillet by drilling prior to cutting.
 - 5. Do not flame cut aluminum alloys.
 - 6. Punch or drill rivet or bolt holes to finished size before assembly:
 - a. Make finished diameter of holes for bolts 1/16-inch maximum larger than nominal bolt diameter.
 - b. Make holes cylindrical and perpendicular to principal surface.
 - c. Do not permit holes to drift in a manner to distort metal.
- C. Aluminum forming and assembly:
 - 1. Do not heat structural aluminum, except as follows:
 - a. Heat aluminum to 400 degrees Fahrenheit for 30 minutes maximum, to facilitate bending or welding.
 - b. Heat only when proper temperature controls and supervision can ensure that limitations on temperature and time are observed.
- D. Before assembly, remove chips lodged between contacting surfaces.
- E. Welding aluminum:
 - 1. Perform welding of aluminum in accordance with AWS D1.2.

2. Weld aluminum in accordance with the following:
 - a. Preparation:
 - 1) Remove dirt, grease, forming or machining lubricants, and organic materials from areas to be welded by cleaning with a suitable solvent or by vapor degreasing.
 - 2) Additionally, etch or scratch brush to remove oxide coating just prior to welding when inert gas tungsten arc welding method is used.
 - 3) Oxide coating may not need to be removed if welding is performed by automatic or semi-automatic inert gas shielded metal arc.
 - 4) Suitably prepare edges to ensure 100 percent penetration in butt welds by sawing, chipping, machining, or shearing. Do not cut with oxygen.
 - b. Filler metal: Aluminum alloys conforming to the requirements of AWS A5.10 and AWS classification ER 4043, ER 5654, ER 5554, ER 5183, ER 5356, or ER 5556.
 - c. Perform welding of structures which are to be anodized using filler alloys which will not discolor when anodized, AWS ER 5654, ER 5554, ER 5183, ER 5356, or ER 5556.
 - d. Perform welding by using a non-consumable tungsten electrode with filler metal in an inert gas atmosphere (TIG) or using a consumable filler metal electrode in an inert gas atmosphere (MIG).
 - e. Do not use welding process that requires use of a welding flux.
 - f. Neatly make welded closures.
 - g. Where weld material interferes with fit or is unsightly in appearance, grind it smooth.
 - h. Make welds full penetration welds unless otherwise indicated on the Drawings.

2.03 FINISHES

- A. Coating for dissimilar metals:
 1. Epoxy mastic
 - a. As specified in Section 09960 - High-Performance Coatings, coating system EPX-M-5.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of conditions: Examine Work in place to verify that it is satisfactory to receive the Work of this Section. If unsatisfactory conditions exist, do not begin this Work until such conditions have been corrected.

3.02 INSTALLATION

- A. Install structural aluminum products as indicated on the Drawings and specified.
- B. Install structural aluminum products accurately and securely, true to level, plumb, in correct alignment and grade, with all parts bearing or fitting structure or equipment for which intended.

- C. Do not cock out of alignment, redrill, reshape, or force fit fabricated items.
- D. Place anchor bolts or other anchoring devices accurately and make surfaces that bear against structural items smooth and true to level.
- E. Rigidly support and brace structural products needing special alignment to preserve straight, level, even, smooth lines, and keep braced until concrete, grout, or dry pack mortar has hardened for a minimum 48-hour period.
- F. Interface with other products:
 - 1. Where aluminum comes in contact with dissimilar metals, use stainless steel bolts or anchors and separate or isolate the dissimilar metals with isolating sleeves and washers as specified in Section 05190 - Mechanical Anchoring and Fastening to Concrete and Masonry.
 - 2. Coat those parts of aluminum that will be cast into concrete or that will be in contact with concrete, grout, masonry, wood, or other materials that will cause the aluminum to corrode, as specified in Section 09960 - High-Performance Coatings.

END OF SECTION

SECTION 05190

MECHANICAL ANCHORING AND FASTENING TO CONCRETE AND MASONRY

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Cast-in anchors and fasteners:
 - a. Anchor bolts.
 - b. Anchor rods.
 - c. Deformed bar anchors.
 - d. Welded studs.
 - 2. Post-installed steel anchors and fasteners:
 - a. Concrete anchors.
 - b. Sleeve anchors.
 - c. Screw anchors.
 - 3. Appurtenances for anchoring and fastening:
 - a. Anchor bolt sleeves.
 - b. Isolating sleeves and washers.
 - c. Thread coating for threaded stainless steel fasteners.

1.02 REFERENCES

- A. American Concrete Institute (ACI):
 - 1. 355.2 - Qualification of Post-Installed Mechanical Anchors in Concrete & Commentary.
- B. American National Standards Institute (ANSI):
 - 1. B212.15 - Cutting Tools - Carbide-tipped Masonry Drills and Blanks for Carbide-tipped Masonry Drills.
- C. American Welding Society (AWS):
 - 1. D1.1 - Structural Welding Code - Steel.
 - 2. D1.6 - Structural Welding Code - Stainless Steel.
- D. ASTM International (ASTM):
 - 1. A36 - Standard Specification for Carbon Structural Steel.
 - 2. A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 - 3. A108 - Standard Specification for Steel Bars, Carbon and Alloy, Cold Finished.
 - 4. A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - 5. A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - 6. A240 - Standard Specification for Chromium and Chromium Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
 - 7. A380 - Standard Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems.

8. A563 - Standard Specification for Carbon and Alloy Steel Nuts.
 9. B633 - Standard Specification for *Electrodeposited* Coatings of Zinc on Iron and Steel.
 10. B695 - Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel.
 11. E488 - Standard Test Methods for Strength of Anchors in Concrete Elements.
 12. F436 - Standard Specification for Hardened Steel Washers.
 13. F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws and Studs.
 14. F594 - Standard Specification for Stainless Steel Nuts.
 15. F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55 and 105-ksi Yield Strength.
 16. F2329 - Standard Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners.
- E. International Code Council Evaluation Service, Inc. (ICC-ES):
1. AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements.
 2. AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry.
 3. AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements.

1.03 DEFINITIONS

- A. Built-in anchor: Headed bolt or assembly installed in position before filling surrounding masonry units with grout.
- B. Cast-in anchor: Headed bolt or assembly installed in position before placing plastic concrete around.
- C. Overhead installations: Fasteners installed on overhead surfaces where the longitudinal axis of the fastener is more than 60 degrees above a horizontal line so that the fastener resists sustained tension loads.
- D. Passivation: Chemical treatment of stainless steel with a mild oxidant for the purpose of enhancing the spontaneous formation of the steel's protective passive film.
- E. Post-installed anchor: Fastener or assembly installed in hardened concrete or finished masonry construction, typically by drilling into the structure and inserting a steel anchor assembly.
- F. Terms relating to structures or building environments as used with reference to anchors and fasteners:
1. Corrosive locations: Describes interior and exterior locations as follows:
 - a. Locations used for delivery, storage, transfer, or containment (including spill containment) of chemicals used for plant treatment processes.
 - b. Exterior and interior locations at the following treatment structures:
 - 1) Wastewater treatment facilities: Liquids stream:
 - a) Raw wastewater delivery and holding structures.
 - b) Headworks and grit facilities.
 - c) Primary clarifiers and primary clarifier flow splitting boxes.
 - d) Chlorine contact structures.

- 2) Wastewater treatment facilities: Solids stream:
 - a) Sludge holding and thickening tanks.
 - b) Digesters.
 - c) Dewatering facilities.
2. Wet and moist locations: Describes locations, other than “corrosive locations,” that are submerged, are immediately above liquid containment structures, or are subject to frequent wetting, splashing, or wash down. Includes:
 - a. Exterior portions of buildings and structures.
 - b. Liquid-containing structures:
 - 1) Locations at and below the maximum operating liquid surface elevation.
 - 2) Locations above the maximum operating liquid surface elevation and:
 - a) Below the top of the walls containing the liquid.
 - b) At the inside faces and underside surfaces of a structure enclosing or spanning over the liquid (including walls, roofs, slabs, beams, or walkways enclosing the open top of the structure).
 - c. Liquid handling equipment:
 - 1) Bases of pumps and other equipment that handles liquids.
 - d. Indoor locations exposed to moisture, splashing, or routine wash down during normal operations, including floors with slopes toward drains or gutters.
 - e. Other locations indicated on the Drawings.
3. Other locations:
 - a. Interior dry areas where the surfaces are not exposed to moisture or humidity in excess of typical local environmental conditions.

1.04 SUBMITTALS

- A. General:
 1. Submit information listed for each type of anchor or fastener to be used.
- B. Action submittals:
 1. Product data:
 - a. Cast-in anchors:
 - 1) Manufacturer’s data including catalog cuts showing anchor sizes and configuration, materials, and finishes.
 - b. Post-installed anchors:
 - 1) For each anchor type, manufacturer’s data including catalog cuts showing anchor sizes and construction, materials and finishes, and load ratings.
 2. Samples:
 - a. Samples of each type of anchor, including representative diameters and lengths, if requested by the Engineer.
 3. Certificates:
 - a. Cast-in anchors:
 - 1) Mill certificates for steel anchors that will be supplied to the site.
 - b. Post-installed anchors:
 - 1) Manufacturer’s statement or certified test reports demonstrating that anchors that will be supplied to the site comply with the materials properties specified.

4. Test reports:
 - a. Post-installed anchors: For each anchor type used for the Work:
 - 1) Current ICC-ES Report (ESR) demonstrating:
 - a) Acceptance of that anchor for use under the building code specified in Section 01410 - Regulatory Requirements.
5. Manufacturer's instructions:
 - a. Requirements for storage and handling.
 - b. Recommended installation procedures including details on drilling, hole size (diameter and depth), hole cleaning and preparation procedures, anchor insertion, and anchor tightening.
 - c. Requirements for inspection or observation during installation.
6. Qualification statements:
 - a. Post-installed anchors: Installer qualifications:
 - 1) Submit list of personnel performing installations and include date of manufacturer's training for each.

1.05 QUALITY ASSURANCE

- A. Qualifications:
 1. Post installed anchors shall be in accordance with building code specified in Section 01410 - Regulatory Requirements.
- B. Special inspection:
 1. Provide special inspection of post-installed anchors as specified in Section 01455 - Regulatory Quality Assurance and this Section.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver post-installed anchors in manufacturer's standard packaging with labels visible and intact. Include manufacturer's installation instructions.
- B. Handle and store anchors and fasteners in accordance with manufacturer's recommendations and as required to prevent damage.
- C. Protect anchors from weather and moisture until installation.

1.07 PROJECT CONDITIONS

- A. As specified in Section 01610 - Project Design Criteria.
- B. Seismic Design Category (SDC) for structures is indicated on the Drawings.

PART 2 PRODUCTS

2.01 MANUFACTURED UNITS

- A. General:
 1. Furnish threaded fasteners with flat washers and hex nuts fabricated from materials corresponding to the material used for threaded portion of the anchor.
 - a. Cast-in anchors: Provide flat washers and nuts as listed in the ASTM standard for the anchor materials specified.

- b. Post-installed anchors: Provide flat washers and nuts supplied for that product by the manufacturer of each anchor.
2. Size of anchors and fasteners, including diameter and length or minimum effective embedment depth: As indicated on the Drawings or as specified in this Section. In the event of conflicts, contact Engineer for clarification.
3. Where anchors and connections are not specifically indicated on the Drawings or specified, their material, size and form shall be equivalent in quality and workmanship to items specified.

B. Materials:

1. Provide and install anchors of materials as in this Section.

2.02 CAST-IN ANCHORS AND FASTENERS

A. Anchor bolts:

1. Description:

- a. Straight steel rod having one end with an integrally forged head, and one threaded end. Embedded into concrete with the headed end cast into concrete at the effective embedment depth indicated on the Drawings or specified, and with the threaded end left to project clear of concrete face as required for the connection to be made.
- b. Furnish anchor bolts with heavy hex forged head or equivalent acceptable to Engineer.
 - 1) Rods or bars with angle bend for embedment in concrete (i.e., "L" or "J" shaped anchor bolts) are not permitted in the Work.

2. Materials:

- a. Ship anchor bolts with properly fitting nuts attached.
- b. Type 316 stainless steel:
 - 1) Surfaces descaled, pickled, and passivated in accordance with ASTM A380.
 - 2) Bolts: ASTM F593, Group 2, Condition CW, coarse threads.
 - 3) Nuts: ASTM F594. Match alloy (group and UNS designation) and threads of bolts.
 - 4) Washers: Type 316 stainless steel.
- c. Type 304 stainless steel:
 - 1) Surfaces descaled, pickled, and passivated in accordance with ASTM A380.
 - 2) Bolts: ASTM F593, Group 1, Condition CW, coarse threads.
 - 3) Nuts: ASTM F594. Match alloy (group and UNS designation) and threads of bolts.
 - 4) Washers: Type 304 stainless steel.
- d. Galvanized steel:
 - 1) Hot-dip galvanized coating in accordance with ASTM F2329.
 - 2) Bolt: ASTM F1554, Grade 36, heavy hex, coarse thread.
 - 3) Nuts: ASTM A563, Grade A, heavy hex, threads to match bolt.
 - 4) Washers: ASTM F436, Type 1.

B. Anchor rods:

1. Description: Straight steel rod having threads on each end. One threaded end is fitted with nuts or plates and embedded in concrete to the effective depth indicated on the Drawings, leaving the opposite threaded end to project clear of the concrete face as required for the connection to be made at that location.

2. Materials:
 - a. Stainless steel: Type 316:
 - 1) Surfaces descaled, pickled, and passivated in accordance with ASTM A380.
 - 2) Rod: ASTM F593, Group 2, Condition CW, coarse threads.
 - 3) Nuts: ASTM F594. Match alloy (group and UNS designation) and threads of rods.
 - 4) Washers: Type 316 stainless steel.
 - 5) Plates (embedded): ASTM A240.
 - b. Stainless steel: Type 304:
 - 1) Surfaces descaled, pickled, and passivated in accordance with ASTM A380.
 - 2) Rod: ASTM F593, Group 1, Condition CW, coarse threads.
 - 3) Nuts: ASTM F594. Match alloy (group and UNS designation) and threads or rods.
 - 4) Washers: Type 304 stainless steel.
 - 5) Plates (embedded): ASTM A240.
 - c. Galvanized: steel:
 - 1) Hot-dip galvanized with coating in accordance with ASTM F2329.
 - 2) Rod: ASTM F1554, Grade 36, coarse thread.
 - 3) Nuts: ASTM A563, Grade A, threads to match rod.
 - 4) Washers: ASTM F436, Type 1.
 - 5) Plates (embedded): ASTM A36.

C. Welded studs:

1. Description: Anchor with forged head for embedment into concrete on one end, and welding ferrule for attachment to steel on the other. Welded to steel members or plates to provide anchorage for steel connections to concrete.
2. Acceptance criteria:
 - a. Welded studs in accordance with AWS D1.1, Type B.
3. Manufacturers: One of the following or equal:
 - a. Nelson Stud Welding Co., H4L Concrete Anchors or S3L Shear Connectors as indicated on the Drawings.
 - b. Stud Welding Products, Headed Concrete Anchors (HCA) or Headed Shear Connectors (HSC) as indicated on the Drawings.
4. Materials:
 - a. Stainless steel: Type 316L:
 - b. Stainless steel: Type 304L:
 - c. Galvanized steel:
 - 1) Hot-dip galvanized after fabrication with coating in accordance with ASTM A123.
 - 2) Steel: Carbon steel in accordance with ASTM A108 with 50,000 pounds per square inch minimum yield strength, and 60,000 pounds per square inch minimum tensile strength.

D. Steel plates or shapes for fabrications including assemblies with welded studs or deformed bar anchors:

1. Stainless steel: Type 316L or Type 304L:
 - a. Plates (embedded): ASTM A240.
2. Galvanized steel:
 - a. Hot dip galvanized in accordance with ASTM A123.
 - b. Steel: ASTM A36.

2.03 POST-INSTALLED ANCHORS AND FASTENERS - ADHESIVE

- A. Epoxy bonding of reinforcing bars, all thread rods, and threaded inserts in concrete: As specified in Section 03055 - Adhesive-Bonded Reinforcing Bars and All Thread Rods in Concrete.
- B. Epoxy bonding of reinforcing bars, all thread rods, and threaded inserts in masonry: As specified in Section 04055 - Adhesive Bonding Reinforcing Bars and All Thread Rods in Masonry.

2.04 POST-INSTALLED ANCHORS AND FASTENERS - MECHANICAL

- A. General:
 - 1. Post-installed anchors used for the Work shall hold a current ICC Evaluation Service Report demonstrating acceptance for use under the building code specified in Section 01410 - Regulatory Requirements. Conditions of use: The acceptance report shall indicate acceptance of the product for use under the following conditions:
 - 1) In regions of concrete where cracking has occurred or may occur.
 - 2) To resist short-term loads due to wind forces.
 - 3) To resist short-term loading due to seismic forces for the Seismic Design Category of the structure where the product will be used.
 - 2. Substitutions: When requesting product substitutions, submit calculations, indicating the diameter, effective embedment depth and spacing of the proposed anchors, and demonstrating that the substituted product will provide load resistance that is equal to or greater than that provided by the anchors listed in this Section.
 - a. Calculations shall be prepared by and shall bear the signature and seal of a Professional Engineer licensed in the State of **Texas**.
 - b. Decisions regarding the acceptability of proposed substitutions shall be at the discretion of the Engineer.
- B. Concrete anchors:
 - 1. Description. Post-installed anchor assembly consisting of a threaded stud and a surrounding wedge expansion sleeve that is forced outward by torquing the center stud to transfer loads from the stud to the concrete through bearing, friction, or both. (Sometimes referred to as “expansion anchors” or “wedge anchors.”)
 - a. Do not use slug-in, lead cinch, and similar systems relying on deformation of lead alloy or similar materials to develop holding power.
 - 2. Concrete anchors for anchorage to concrete:
 - a. Acceptance criteria:
 - 1) Concrete anchors shall have a current ICC-ES Report demonstrating that the anchors have been tested and qualified for performance in both cracked and un-cracked concrete, and for short-term loading due to wind and seismic forces for Seismic Design Categories A through F in accordance with ACI 355.2 and with ICC-ES AC193 (including all mandatory tests and optional tests for seismic tension and shear in cracked concrete).
 - 2) Concrete anchor performance in the current ICC-ES Report shall be “Category 1” as defined in ACI 355.2.

- b. Manufacturers: One of the following or equal:
 - 1) Hilti, Kwik Bolt TZ Expansion Anchor.
 - 2) DEWALT/Powers, PowerStud.
 - 3) Simpson Strong-Tie, Strong Bolt 2 Wedge Anchor.
 - c. Materials. Integrally threaded stud, wedge, washer, and nut:
 - 1) Stainless steel: Type 316.
 - 2) Galvanized: Carbon steel, zinc plated in accordance with ASTM B633, minimum 5 microns (Fe/Zn 5).
3. Concrete anchors for anchorage to concrete masonry (fully grouted cells):
- a. Acceptance criteria: Concrete anchors shall have a current ICC-ES Report demonstrating that the anchors have been tested and qualified in accordance with ICC-ES AC01, including all mandatory tests and optional seismic tests.
 - b. Manufacturers: One of the following or equal:
 - 1) Hilti, Kwik Bolt 3 Expansion Anchor.
 - 2) DEWALT/Powers, Power-Stud+ SD1.
 - 3) Simpson Strong-Tie, Wedge-All Anchor.
 - c. Materials. Integrally threaded stud, wedge, washer, and nut:
 - 1) Stainless steel: Type 316.
 - 2) Galvanized: Carbon steel, zinc plated in accordance with ASTM B633, minimum 5 microns (Fe/Zn 5) or mechanically galvanized in accordance with ASTM B695, Class 55, Type 1.
- C. Flush shells:
- 1. Description: Post-installed anchor assembly consisting of an internally threaded mandrel that is forced into a pre-drilled concrete hole with a setting tool until the top of the anchor is flush with the face of the concrete. Once installed, a removable threaded bolt is installed in the mandrel.
 - 2. Flush shell anchors are not permitted in the Work.
- D. Sleeve anchors:
- 1. Description: Post-installed, torque-controlled anchor assembly consisting of an externally threaded stud with a spacer sleeve near the surface of the base material, and an expansion sleeve on the lower part of the stud. The expansion sleeve is forced outward by torquing of the center stud to transfer load.
 - a. Do not use slug-in, lead cinch, and similar systems relying on deformation of lead alloy or similar materials in order to develop holding power.
 - 2. Sleeve anchors for anchorage to concrete:
 - a. Acceptance criteria:
 - 1) Sleeve anchors shall have a current ICC-ES Report demonstrating that the anchors have been tested and qualified for performance in both cracked and un-cracked concrete, and for short-term loading due to wind and seismic forces for Seismic Design Categories A through F in accordance with ACI 355.2 and with ICC-ES AC193 (including all mandatory tests and optional tests for seismic tension and shear in cracked concrete).
 - 2) Sleeve anchor performance in the current ICC-ES Report shall be "Category 1" as defined in ACI 355.2.
 - b. Manufacturers: One of the following or equal:
 - 1) Hilti, HSL-3 Heavy Duty Expansion (sleeve) Anchor.
 - 2) DEWALT/Powers, Power Bolt+ Heavy Duty Sleeve Anchor.

- c. Materials:
 - 1) Stainless steel: Not available.
 - 2) Galvanized steel: Carbon steel, zinc plated in accordance with ASTM B633, minimum 5 microns (Fe/Zn 5).
- 3. Sleeve anchors for anchorage to concrete masonry (fully grouted only):
 - a. Acceptance criteria: Sleeve anchors shall have a current ICC-ES Report demonstrating that anchors have been tested and qualified for performance in masonry, including short-term loading due to wind and seismic forces in accordance with ICC-ES AC01.
 - b. Materials:
 - 1) Stainless steel: Not available.
 - 2) Galvanized steel: Carbon steel, zinc plated in accordance with ASTM B633, minimum 5 microns (Fe/Zn 5).

E. Screw anchors:

- 1. Description: Post-installed concrete anchor that develops tensile strength from mechanical interlock provided by creating a helical “key” that is larger than the diameter of the bolt itself along the length of the anchor shaft.
- 2. Screw anchors for anchorage to concrete:
 - a. Acceptance criteria:
 - 1) Screw anchors shall have a current ICC-ES Report demonstrating that the anchors have been tested and qualified for performance in both cracked and un-cracked concrete, and for short-term loading due to wind and seismic forces for Seismic Design Categories A through F in accordance with ACI 355.2 and ICC ES AC193 (including all mandatory tests and optional tests for seismic tension and shear in cracked concrete).
 - 2) Screw anchor performance in the current ICC-ES Report shall be “Category 1” as defined in ACI 355.2.
 - b. Manufacturers: Screw anchor: One of the following or equal:
 - 1) Hilti, Hex head, HUS-EZ Screw Anchor:
 - a) With internally threaded head: HUS-EZ I Hanger Anchor.
 - 2) DEWALT/Powers, Screwbolt+ Screw Anchor:
 - a) With internally threaded head: Vertigo+ Rod Hanging System.
 - 3) Simpson Strong-Tie, Titen® HD Screw Anchor:
 - a) With internally threaded head: Titen® HD Rod Hanger.
 - c. Materials:
 - 1) Stainless steel: Not available.
 - 2) Galvanized steel: Carbon steel, zinc plated in accordance with ASTM B633, minimum 5 microns (Fe/Zn 5) or equal.
- 3. Screw anchors for anchorage to concrete masonry (fully grouted only):
 - a. Acceptance criteria:
 - 1) Acceptance criteria. Screw anchors shall have a current ICC-ES Report demonstrating that anchors have been tested and qualified for performance in masonry, including short-term loading due to wind and seismic forces in accordance with ICC-ES AC106.
 - b. Manufacturers: One of the following or equal:
 - 1) Hilti, HUS-EZ Screw Anchor.
 - 2) Simpson Strong-Tie, Titen® HD Screw Anchor.
 - 3) DEWALT\Powers: Screwbolt+ Screw Anchor.

- c. Materials:
 - 1) Galvanized steel: Carbon steel. Zinc plated in accordance with ASTM B633, minimum 5 microns (Fe/Zn 5); or mechanically galvanized in accordance with ASTM B695; Class 55, Type I.

2.05 APPURTENANCES FOR ANCHORING AND FASTENING

- A. Anchor bolt sleeves:
 - 1. Having inside diameter approximately 2 inches greater than bolt diameter and minimum 10-bolt diameters long.
 - 2. Plastic sleeves:
 - a. High-density polyethylene, corrugated sleeve, threaded to provide adjustment of location on the anchor bolt.
 - b. Manufacturers: The following or equal:
 - 1) Portland Bolt & Manufacturing Co.
 - 3. Fabricated steel sleeves:
 - a. Fabricate to the following dimensions unless otherwise indicated on the Drawings:
 - 1) Inside diameter: At least 2 inches greater than bolt diameter.
 - 2) Inside length: Not less than 10 bolt diameters.
 - 3) Bottom plate:
 - a) Square plate with dimensions equal to the outside diameter of the sleeve plus 1/2 inch each side.
 - b) Thickness equal to or greater than one-half of the anchor bolt diameter.
 - b. Carbon steel anchor bolts:
 - 1) Fabricated from ASTM A36 plate and ASTM A53, Grade B pipe.
 - 2) Welded connections: Conform to requirements of AWS D1.1.
 - 3) Hot dip galvanized in accordance with ASTM A153.
 - c. Stainless steel anchor bolts:
 - 1) Fabricated from ASTM A240 plate and pipe. Type 304L or Type 316L to match Type of the anchor bolt.
 - 2) Welded connections: In accordance with AWS D1.6.
- B. Isolating sleeves and washers:
 - 1. Manufacturers: One of the following or equal:
 - a. Central Plastics Co.
 - b. Allied Corrosion Industries.
 - 2. Sleeves: Mylar, 1/32-inch thick, 4,000 volts per mil dielectric strength, of proper size to fit bolts and extending half way into both steel washers.
 - 3. One sleeve required for each bolt.
 - 4. Washers: The inside diameter of all washers shall fit over the isolating sleeve, and both the steel and isolating washers shall have the same inside diameter and outside diameter.
 - a. Proper size to fit bolts.
 - b. Two 1/8-inch thick steel washers for each bolt.
 - c. G3 Phenolic: 2 insulating washers are required for each bolt:
 - 1) Thickness: 1/8 inch.
 - 2) Base material: Glass.
 - 3) Resin: Phenolic.
 - 4) Water absorption: 2 percent.
 - 5) Hardness (Rockwell): 100.

- 6) Dielectric strength: 450 volts per mil.
- 7) Compression strength: 50,000 pounds per square inch.
- 8) Tensile strength: 20,000 pounds per square inch.
- 9) Maximum operating temperature: 350 degrees Fahrenheit.

- C. Coating for repair of galvanized surfaces:
 1. Manufacturers: The following or equal:
 - a. Jelt, Galvinox.
- D. Thread coating: For use with threaded stainless steel fasteners:
 1. Manufacturers: One of the following or equal:
 - a. Bostik, Never-Seez.
 - b. Oil Research, Inc., WLR No. 111.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine Work in place to verify that it is satisfactory to receive the Work of this Section. If unsatisfactory conditions exist, do not begin this Work until such conditions have been corrected.

3.02 INSTALLATION: GENERAL

- A. Where anchors and fasteners are not specifically indicated on the Drawings or specified, make attachments with materials specified in this Section.
- B. Substitution of anchor types:
 1. Post-installed anchors may not be used as an alternative to cast-in/built-in anchors at locations where the latter are indicated on the Drawings.
 2. Cast-in/built-in anchors may be used as an alternative to post-installed mechanical anchors at locations where the latter are indicated on the Drawings.
- C. Protect products from damage during installation. Take special care to protect threads and threaded ends.
- D. Accurately locate and position anchors and fasteners:
 1. Unless otherwise indicated on the Drawings, install anchors perpendicular to the surfaces from which they project.
 2. Install anchors so that at least 2 threads, but not more than 1/2 inch of threaded rod, projects past the top nut.
- E. Interface with other products:
 1. Where steel anchors come in contact with dissimilar metals (aluminum, stainless steel, etc.), use stainless steel anchors and separate or isolate dissimilar metals using isolating sleeves and washers.
 2. Prior to installing nuts, coat threads of stainless steel fasteners with thread coating to prevent galling of threads.

3.03 INSTALLATION: CAST-IN ANCHORS

- A. General:
1. Accurately locate cast-in and built-in anchors.
 - a. Provide anchor setting templates to locate anchor bolts and anchor rods. Secure templates to formwork.
 - b. Brace or tie off embedments as necessary to prevent displacement during placement of plastic concrete or of surrounding masonry construction.
 - c. Position and tie cast-in and built-in anchors in place before beginning placement of concrete or grout. Do not “stab” anchors into plastic concrete, mortar, or grout.
 - d. Do not allow cast-in anchors to touch reinforcing steel. Where cast-in anchors are within 1/4 inch of reinforcing steel, isolate the metals by wrapping the anchors with a minimum of 4 wraps of 10-mil polyvinyl chloride tape in area adjacent to reinforcing steel.
 2. For anchoring at machinery bases subject to vibration, use 2 nuts, with 1 serving as a locknut.
 3. Where anchor bolts or anchor rods are indicated on the Drawings as being for future use, thoroughly coat exposed surfaces that project from concrete or masonry with non-oxidizing wax. Turn nuts down full length of the threads, and neatly wrap the exposed thread and nut with a minimum of 4 wraps of 10-mil waterproof polyvinyl tape.
- B. Anchor bolts:
1. Minimum effective embedment: 10-bolt diameters, unless a longer embedment is indicated on the Drawings.
 2. Where indicated on the Drawings, set anchor bolts in plastic, galvanized steel or stainless steel sleeves to allow for adjustment. Seal top of sleeve to prevent grout from filling sleeve.
- C. Anchor rods:
1. Install as specified for anchor bolts.
- D. Deformed bar anchors:
1. Butt weld to steel fabrications with automatic stud welding gun as recommended by manufacturer.
 2. Ensure that butt weld develops the full strength of the anchor.
- E. Welded studs:
1. Butt weld to steel fabrications with automatic stud welding gun as recommended by the manufacturer.
 2. Ensure that butt weld develops full strength of the stud.

3.04 INSTALLATION: POST-INSTALLED ADHESIVE ANCHORS

- A. Epoxy and acrylic adhesive bonding of reinforcing bars, all thread rods, and internally threaded inserts in concrete: As specified in Section 03055 - Adhesive-Bonded Reinforcing Bars and All Thread Rods in Concrete.
- B. Epoxy and acrylic adhesive bonding of reinforcing bars, all thread rods, and internally threaded inserts in masonry: As specified in Section 04055 - Adhesive Bonding Reinforcing Bars and All Thread Rods in Masonry.

3.05 INSTALLATION: POST-INSTALLED MECHANICAL ANCHORS

- A. General:
 - 1. Install anchors in accordance with the manufacturer's instructions, ACI 355.2, the anchor's ICC-ES Report. Where conflict exists between the ICC-ES Report and the requirements in this Section, the requirements of the ICC-ES Report shall control.
 - 2. Where anchor manufacturer recommends the use of special tools and/or specific drill bits for installation, provide and use such tools.
 - 3. After anchors have been positioned and inserted into concrete or masonry, do not:
 - a. Remove and reuse/reinstall anchors.
 - b. Loosen or remove bolts or studs.

- B. Holes drilled into concrete and masonry:
 - 1. Do not drill holes in concrete or masonry until the material has achieved its minimum specified compression strength (f'_c or f'_m).
 - 2. Accurately locate holes:
 - a. Before drilling holes, use a reinforcing bar locator to identify the position of all reinforcing steel, conduit, and other embedded items within a 6-inch radius of each proposed hole.
 - b. If the hole depth exceeds the range of detection for the rebar locator, the Engineer may require radiographs of the area designated for investigation before drilling commences.
 - 3. Exercise care to avoid damaging existing reinforcement and other items embedded in concrete and masonry.
 - a. If embedments are encountered during drilling, immediately stop work and notify the Engineer. Await Engineer's instructions before proceeding.
 - 4. Unless otherwise indicated on the Drawings, drill holes perpendicular to the concrete surface into which they are placed.
 - 5. Drill using anchor manufacturer's recommended equipment and procedures:
 - a. Unless otherwise recommended by the manufacturer, drill in accordance with the following:
 - 1) Drilling equipment: Electric or pneumatic rotary type with light or medium impact. Where edge distances are less than 2 inches, use lighter impact equipment to prevent micro-cracking and concrete spalling during drilling process.
 - 2) Drill bits: Carbide-tipped in accordance with ANSI B212-15. Hollow drills with flushing air systems are preferred.
 - 6. Drill holes at manufacturer's recommended diameter and to depth required to provide the effective embedment indicated.
 - 7. Clean and prepare holes as recommended by the manufacturer and as required by the ICC-ES Report for that anchor.
 - a. Unless otherwise recommended by anchor manufacturer, remove dust and debris using brushes and clean compressed air.
 - b. Repeat cleaning process as required by the manufacturer's installation instructions.
 - c. When cleaning holes for stainless steel anchors, use only stainless steel or non-metallic brushes.

- C. Insert and tighten (or torque) anchors in full compliance with the manufacturer's installation instructions.
- Once anchor is tightened (torque), do not attempt to loosen or remove its bolt or stud.
- D. Concrete anchors: Minimum effective embedment lengths unless otherwise indicated on the Drawings:

Concrete Anchors			
Nominal Diameter	Minimum Effective Embedment Length		Minimum Member Thickness
	In Concrete	In Grouted Masonry	
3/8 inch	2 1/2 inch	2 5/8 inch	8 inch
1/2 inch	3 1/2 inch	3 1/2 inch	8 inch
5/8 inch	4 1/2 inch	4 1/2 inch	10 inch
3/4 inch	5 inch	5 1/4 inch	12 inch

- E. Flush shell anchors:
- Flush shell anchors are not permitted in the Work.
 - If equipment manufacturer's installation instructions recommend the use of flush shell anchors, contact Engineer for instructions before proceeding.

- F. Sleeve anchors:
- Minimum effective embedment lengths unless otherwise indicated on the Drawings:

Sleeve Anchors			
Nominal Diameter	Minimum Effective Embedment Length		Minimum Member Thickness
	In Concrete	In Grouted Masonry	
M8 (1/2 inch)	70 mm (2 3/4 inch)	Not accepted	100 mm (8 inch)
M10 (5/8 inch)	76 mm (3 inch)	Not accepted	250 mm (10 inch)
M12 (3/4 inch)	80 mm (3 1/4 inch)	Not accepted	300 mm (12 inch)

- Install with the sleeve fully engaged in the base material.

- G. Screw anchors:
- Minimum effective embedment lengths unless otherwise indicated on the Drawings:

Screw Anchors			
Nominal Diameter	Minimum Effective Embedment Length		Minimum Member Thickness
	In Concrete	In Grouted Masonry	
3/8 inch	2 1/2 inch	3 1/4 inch	8 inch
1/2 inch	3 1/4 inch	4 1/2 inch	8 inch

Screw Anchors			
Nominal Diameter	Minimum Effective Embedment Length		Minimum Member Thickness
	In Concrete	In Grouted Masonry	
5/8 inch	4 inch	5 inch	10 inch
3/4 inch	5 1/2 inch	6 1/4 inch	12 inch

2. Install screw anchors using equipment and methods recommended by the manufacturer. Continue driving into hole until the washer head is flush against the item being fastened.

H. Undercut concrete anchors:

1. Minimum effective embedment lengths unless otherwise indicated on the Drawings:

Undercut Anchors			
Nominal Diameter (bolt)	Minimum Effective Embedment Length		Minimum Member Thickness⁽¹⁾
	In Concrete	In Grouted Masonry	
M10 (3/8 inch)	100 mm (4 inch)	Not accepted	200 mm (8 inch)
M12 (1/2 inch)	125 mm (5 inch)	Not accepted	350 mm (14 inch)
M16 (5/8 inch)	190 mm (7 1/2 inch)	Not accepted	460 mm (18 inch)
M20 (7/8 inch)	250 mm (10 inch)	Not accepted	510 mm (20 inch)

Notes:

(1) Thickness indicated is for pre-set units. If through-set units are accepted, obtain minimum member thickness requirements from the Engineer.

2. Installations of undercut anchors shall not be allowed where edge distances are less than 12 times the nominal diameter of the anchor stud.
3. Undercut bottom of hole using cutting tools manufactured for this purpose by the manufacturer of the undercut anchors being placed.

3.06 FIELD QUALITY CONTROL

- A. Contractor shall provide quality control over the Work of this Section as specified.
 1. Expenses associated with work described by the following paragraphs shall be paid by the Contractor.
- B. Post-installed anchors:
 1. Review anchor manufacturer's installation instructions and requirements of the Evaluation Service Report (hereafter referred to as "installation documents") for each anchor type and material.
 2. Observe hole-drilling and cleaning operations for conformance with the installation documents.
 3. Certify in writing to the Engineer that the depth and location of anchor holes, and the torque applied for setting the anchors conforms to the requirements of the installation documents.

3.07 FIELD QUALITY ASSURANCE

- A. Owner will provide on-site observation and field quality assurance for the Work of this Section.
 - 1. Expenses associated with work described by the following paragraphs shall be paid by the Owner.

- B. Field inspections and special inspections:
 - 1. Required inspections: Observe construction for conformance to the approved Contract Documents, the accepted submittals, and manufacturer's installation instructions for the products used.
 - 2. Record of inspections:
 - a. Maintain record of each inspection.
 - b. Submit copies to Engineer upon request.
 - 3. Statement of special inspections: At the end of the project, prepare and submit to the Engineer and the authority having jurisdiction inspector's statement that the Work was constructed in general conformance with the approved Contract Documents, and that deficiencies observed during construction were resolved.

- C. Special inspections: Anchors cast into concrete and built into masonry.
 - 1. Provide special inspection during positioning of anchors and placement of concrete or masonry (including mortar and grout) around the following anchors:
 - a. Anchor bolts.
 - b. Anchor rods.
 - c. Deformed bar anchors.
 - d. Welded studs.
 - 2. During placement, provide continuous special inspection at each anchor location to verify that the following elements of the installation conform to the requirements of the Contract Documents.
 - a. Anchor:
 - 1) Type and dimensions.
 - 2) Material: Galvanized steel, Type 304 stainless steel, or Type 316 stainless steel as specified in this Section or indicated on the Drawings.
 - 3) Positioning: Spacing, edge distances, effective embedment, and projection beyond the surface of the construction.
 - 4) Reinforcement at anchor: Presence, positioning, and size of additional reinforcement at anchors indicated on the Drawings.
 - 3. Following hardening and curing of the concrete or masonry surrounding the anchors, provide periodic special inspection to observe and confirm the following:
 - a. Base material (concrete or grouted masonry):
 - 1) Solid and dense concrete or grouted masonry material within required distances surrounding anchor.
 - 2) Material encapsulating embedment is dense and well-consolidated.

- D. Special Inspections: Post-installed mechanical anchors placed in hardened concrete and in grouted masonry.
 - 1. Provide special inspection during installation of the following anchors:
 - a. Concrete anchors.

- b. Sleeve anchors.
- c. Screw anchors.
- 2. Unless otherwise noted, provide periodic special inspection during positioning, drilling, placing, and torquing of anchors.
 - a. Provide continuous special inspection for post-installed anchors in “overhead installations” as defined in this Section.
- 3. Requirements for periodic special inspection:
 - a. Verify items listed in the following paragraphs for conformance to the requirements of the Contract Documents and the Evaluation Report for the anchor being used. Observe the initial installation of each type and size of anchor, and subsequent installation of the same anchor at intervals of not more than 4 hours.
 - 1) Any change in the anchors used, in the personnel performing the installation, or in procedures used to install a given type of anchor shall require a new “initial inspection.”
 - b. Substrate: Concrete or masonry surfaces receiving the anchor are sound and of a condition that will develop the anchor’s rated strength.
 - c. Anchor:
 - 1) Manufacturer, type, and dimensions (diameter and length).
 - 2) Material (galvanized, Type 304 stainless steel, or Type 316 stainless steel).
 - d. Hole:
 - 1) Positioning: Spacing and edge distances.
 - 2) Drill bit type and diameter.
 - 3) Diameter, and depth.
 - 4) Hole cleaned in accordance with manufacturer’s required procedures. Confirm multiple repetitions of cleaning when recommended by the manufacturer.
 - 5) Anchor’s minimum effective embedment.
 - 6) Anchor tightening/installation torque.
- 4. Requirements for continuous special inspection:
 - a. The special inspector shall observe all aspects of anchor installation, except that holes may be drilled in their absence provided that they confirm the use of acceptable drill bits before drilling, and later confirms the diameter, depth, and cleaning of drilled holes.

E. Field tests:

- 1. Owner may, at any time, request testing to confirm that materials being delivered and installed conform to the requirements of the Specifications.
 - a. If such additional testing shows that the materials do not conform to the specified requirements, the Contractor shall pay the costs of these tests.
 - b. If such additional testing shows that the materials do conform to the specified requirements, the Owner shall pay the costs of these tests.

3.08 NON-CONFORMING WORK

- A. Remove misaligned or non-performing anchors.

- B. Fill empty anchor holes and repair failed anchor locations as specified using high-strength, non-shrink, non-metallic grout.
- C. If more than 10 percent of all tested anchors of a given diameter and type fail to achieve their specified torque or proof load, the Engineer will provide directions for required modifications. Make such modifications, up to and including replacement of all anchors, at no additional cost to the Owner.

3.09 SCHEDULES

- A. Stainless steel. Provide and install stainless steel anchors at the following locations:
 - 1. "Corrosive locations" as defined in this Section: Type 316 stainless steel
 - 2. "Wet and moist locations" as defined in this Section: Type 316 stainless steel.
 - 3. "Other locations:"
 - a. For connecting stainless steel members to concrete or masonry: Type 304 stainless steel.
 - b. For connecting aluminum members to concrete or masonry.
 - c. For connecting fiber-reinforced plastic (FRP) members to concrete or masonry.
 - 4. At locations indicated on the Drawings.
- B. Galvanized: Provide and install galvanized carbon steel anchors at the following locations:
 - 1. Locations not requiring stainless steel.
 - 2. At locations indicated on the Drawings.
- C. Provide and install anchor materials as scheduled in the following Table.

Table - Required Anchoring Materials by Location			
Location/Exposure		Materials	Notes
1.	Anchors into concrete and grouted masonry for attachment of carbon steel, including structural steel and other steel fabrications:		
a)	Interior dry areas	Carbon steel - galvanized	
b)	Locations with galvanized steel structures or fabrications	Stainless steel - Type 304 or 316	1
c)	Exterior and interior wet and moist locations	Stainless steel - Type 316	1
d)	Corrosive locations	Stainless steel - Type 316	1
2.	Anchors into concrete and grouted masonry for attachment of aluminum, stainless steel, or fiber-reinforced plastic (FRP) shapes and fabrications:		
a)	Interior dry areas	Stainless steel - Type 304 or 316	1
b)	Exterior and interior wet and moist locations	Stainless steel - Type 316	1
c)	Corrosive locations	Stainless steel - Type 316	1

Table - Required Anchoring Materials by Location			
Location/Exposure		Materials	Notes
3.	Anchors for attaching equipment and its appurtenances:		
a)	All locations	Stainless steel - Type 316 (unless Type 304 is specifically indicated in the specifications for the equipment.)	1
<u>Notes:</u> (1) Where anchors are in contact with a metal that differs from that of the anchor, provide isolation sleeves and washers.			

END OF SECTION

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SECTION 05219

STEEL TRUSS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Steel truss and accessories.
 - 2. Welding and bolts for connections at Steel trusses.

1.02 REFERENCES

- A. American Welding Society (AWS):
 - 1. A2.4 - Standard Symbols for Welding, Brazing, and Non-Destructive Examination.
 - 2. B2.1 - Specification for Welding Procedure and Performance Qualification.
 - 3. D1.1 - Structural Welding Code - Steel.
- B. ASTM International (ASTM):
 - 1. A563 - Standard Specification for Carbon and Alloy Steel Nuts.
 - 2. F436 - Standard Specification for Hardened Steel Washers.
 - 3. F3125 - Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi and 150 ksi Minimum Tensile Strength.
- C. Society for Protective Coatings (SSPC):
 - 1. Paint 15 - Steel Truss Shop Primer/Metal Building Primer.
 - 2. SP-15 - Commercial Grade Power tool Cleaning.

1.03 SUBMITTALS

- A. Product data:
 - 1. Manufacturer's specifications and installation instructions for each type of truss and accessories.
 - 2. Coatings:
 - a. Shop coating. Manufacturer's product data sheets indicating type and characteristics of applied coatings, and recommendations for preparation and materials for finished coatings.
- B. Shop drawings:
 - 1. General:
 - a. Provide fabrication drawings/schedules, and erection/layout drawings for trusses and related miscellaneous metal work.
 - b. Clearly indicate portion of the Work covered by each submittal, and location of each member in the work.
 - c. Mark number or tags on trusses and fabrications shall be the same mark numbers indicated on fabrication schedules and erection drawings.
 - d. Indicate shop and field welds using symbols in accordance with AWS A2.4. Indicate net weld lengths.

2. Fabrication drawings/schedules:
 - a. Detail each piece or assembly to be incorporated into the work.
 - b. For each truss type and size, and for each accessory, indicate:
 - 1) Identification mark number.
 - 2) Loading criteria and camber.
 - 3) Configuration and details including truss elevation view; bearing seats; end conditions; chord extensions; and details of internal joints, welds, and splices (if any).
 - 4) Dimensions, both overall and internal.
 - 5) Methods of connecting, anchoring, fastening, bracing, bridging, and attaching.
 - 6) Coatings and surface preparation.
 3. Erection/layout drawings:
 - a. Indicate placement of each piece shown in the fabrication drawings/schedules or listed in the bill of materials.
 - b. Show layout of trusses with mark numbers; methods of framing at openings; locations, types, and connection details for bridging; details of connections between trusses, framing, or structures; and accessories.
 - c. Indicate erection sequence and requirements for temporary bracing.
 - d. Show requirements for field welding and bolting.
 - e. Show profiles and deflection criteria under live and total loads for truss configurations.
 - f. List loads used in the design of steel trusses.
 - 1) Show loads and position of loads from mechanical and electrical equipment supported by the truss and framing.
- C. Calculations:
1. Submit calculations for each truss type and span, documenting adequacy to resist uniform and concentrated loads indicated on the Drawings; locations, sizes and types of bridging for resisting downward and uplift loads; and adequacy of connections of trusses.
 2. Provide calculation cover letter sealed and signed by the truss manufacturer's qualified registered design professional licensed in the state of Texas.
- D. Certificates/certifications:
1. Quality control program: Submit evidence of active participation in a nationally recognized program for quality control of steel fabrication.
 2. Field welding. Submit welder qualification certificates in accordance with AWS D1.1 for the types of welding and welding positions required for the Work.
- E. Test and inspection reports:
1. Mill test reports: Submit manufacturer's certificates, indicating ASTM standards, structural strength, and material properties for steel used in the truss.
 2. Inspections:
 - a. Source quality control.
 - 1) Submit reports of manufacturer's in-plant inspections.
 - b. Field quality control:
 - 1) Submit Installation and Welding Inspection Report as specified in Attachment A - Installation and Welding Inspection Report.
 - c. Field quality assurance.

1.04 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Truss Installer/Erector:
 - a. Field Welding: Qualified procedures and welders in accordance with AWS D1.1. Provide welders qualified within the last 12 months preceding the date of truss erection.
- B. Regulatory requirements:
 - 1. In accordance with OSHA requirements for steel erection, including specific requirements for trusses.
- C. Inspection:
 - 1. Provide inspections for Field Quality Control and Field Quality Assurance as specified in Part 3, Execution.
- D. Pre-installation conference: Steel truss and deck.
 - 1. Coordinate with the requirements of Section 05310 - Steel Deck.
 - 2. Schedule and conduct pre-installation conference at least 2 weeks prior to installation of trusses.
 - a. Provide additional conferences if necessary to discuss or coordinate specific conditions of installation.
 - 3. Required attendees:
 - a. Contractor.
 - b. Steel truss manufacturer's technical representative.
 - c. Steel truss installer's job superintendent.
 - d. Subcontractor(s) providing and installing coatings under Division 9.
 - 4. Agenda:
 - a. Truss submittals.
 - b. Deck placing and fastening procedures.
 - c. Manufacturer's recommended inspections and inspection procedures.
 - d. Requirements and coordination for quality control inspections and quality assurance (including special inspections).
 - e. Other Specification requirements requiring coordination between parties to the work.
 - 5. Prepare and submit minutes of the pre-installation conference.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Transport, deliver, store, and handle steel truss as recommended and as required to avoid stresses and to prevent damage to materials and coatings.
- B. Observe delivered materials for damage before and after unloading, and note any permanent bends, deformations, broken welds, or other damage on the receiving documents.
- C. Store trusses off the ground, protected from weather and corrosion, and under watertight covering sloped to drain.
 - 1. Support by means that will protect members from distortion and damage.

1.06 WARRANTY

- A. As specified in Section 01783 - Warranties and Bonds.

- B. Special warranty:
 - 1. Duration: 5 years warranty on trusses.

PART 2 PRODUCTS

2.01 DESIGN AND PERFORMANCE CRITERIA

- A. Pre-engineered, pre-fabricated steel trusses and accessories designed and fabricated to the requirements and details as specified in this Section and indicated on the Drawings.
- B. Design requirements:
 - a. Maximum deflection under live load:
 - 1) Roof trusses: Span divided by 240 ($L/240$).
 - 2)
 - b. Minimum design loads as indicated on the Drawings:
 - 1) Dead load.
 - 2) Live load.
 - 3) Wind load (net uplift).
 - 4) Axial tension and compression forces applied to the truss at end connections.
 - c. Camber: Provide standard camber based on industry Standard Specifications unless otherwise indicated on the Drawings.
 - 1) In no case shall trusses be manufactured with negative (downward) camber.
- 2. End anchorage: Provide end anchorage details to secure and/or stabilize trusses at supports, and to transfer any loads indicated on the Drawings.
- 3. Header units: Provide header units to support trusses at openings in floor or roof framing not framed with structural steel shapes.
- 4. Accessories:
 - a. Provide miscellaneous items including splice plates, reinforcing angles, and bolts required to complete the installation.
 - b. Provide supplemental steel framing to support steel deck where normal deck bearing is precluded by other framing members and minor openings.

2.02 MATERIALS

- A. Steel trusses:
 - 1. Provide truss type, chord configuration, depth, and bearing as indicated on the Drawings.
 - 2. Details: Provide the following.
 - a. Chord members: Rolled double angle sections only. Rod or bar members are not permitted.
 - 1)
 - b. Chord extensions: Truss girders.
 - 1) Truss girder bottom chord extension with vertical slip connection at and stabilizer plate that is fastened to supporting structure.
- B. Fasteners:
 - 1. Anchor bolts and anchor rods to concrete and masonry: As specified in Section 05190 - Mechanical Anchoring and Fastening to Concrete and Masonry.

2. Bolts: pre-tensioned bolted connections.
 - a. Provide high-strength bolt assembly with hardened flat washers and nuts. Provide uncoated components unless galvanized coating is indicated on the Drawings.
 - b. Uncoated:
 - 1) Bolts: Plain, heavy hex structural bolts conforming to ASTM F3125, Grade A325, Type 1.
 - 2) Nuts: Heavy hex nuts conforming to ASTM A563, Grade C.
 - 3) Washers: Circular flat washers conforming to ASTM F436.
- C. Accessories:
 1. Bearing plates: As specified.

2.03 FABRICATION

- A. Steel trusses:
 1. Fabricate steel truss in accordance with industry Standard Specifications to details indicated on the Drawings..
- B. End anchorage: Provide end anchorage, including bearing plates, to secure trusses to adjacent construction as indicated on the Drawings.

2.04 SOURCE QUALITY CONTROL

- A. Tests and inspections:
 1. Provide truss manufacturer's inspection as required. Submit inspection results.
 2. Special Inspection - Fabrication. Requirements of the building code specified in Section 01450 - Regulatory Requirements for special inspection of fabricated structural items shall be considered to be satisfied when the manufacturer is registered and approved to perform steel fabrication work in accordance with a quality control program that is certified by the Steel Truss Institute (STI), the American Institute of Steel Construction (AISC), or similar program acceptable to building official and the Engineer.

PART 3 EXECUTION

3.01 GENERAL

- A. Furnish and erect steel trusses.

3.02 PREPARATION

- A. Field verify dimensions and elevations of structural elements supporting the truss and truss girders.
 1. Establish lines and elevations within tolerances before beginning erection.
 2. Make bearing surfaces true and uniform.
 3. Do not begin placement of steel trusses until supporting work is in place and secured.
- B. Clean bearing surfaces of trusses and supporting members before erection and as required during erection to maintain solid contact between members.

3.03 INSTALLATION

- A. Erection:
1. Place and secure steel trusses in accordance with approved erection drawings, and these Specifications.
 2. Allow for loads from erection procedures, but do not load trusses until fastening is complete.
 3. Provide sufficient temporary bracing to maintain trusses and supporting framing safe, plumb, and in true alignment until completion of erection and installation of permanent bridging and bracing.
- B. Installation of trusses and bridging:
1. Do not start placement of steel trusses until supporting work is in place, adjusted to specified tolerances, and secured.
 2. Do not field modify, alter, or repair trusses unless specific written instructions have been received from the truss manufacturer and submitted to the Engineer. Such instructions shall bear the seal and signature of the truss manufacturer's registered design professional licensed in the state where the trusses are installed.
 3. Place trusses on supporting surfaces, adjust, and accurately align to required elevation, location and spacing before permanently fastening.
 - a. Set trusses plumb and level (with indicated allowances for camber).
 - b. Set "tag end" of trusses at location shown on the erection plans.
 - c. Adjust bearing shoe elevations to provide full bearing after trusses and supporting members have been plumbed and positioned, but before final tightening of connections and before any loads are imposed.
 - d. Solidly pack areas under bearing plates using materials and procedures indicated on the Drawings.
- C. Fastening trusses:
1. Each truss must be attached at a minimum of one end immediately upon placement in the final erection position and before additional trusses are placed.
 2. When field welding trusses, weld to supporting steel framework as indicated on the Drawings.
 - a. Coordinate welding sequence and procedure with placing of trusses.
 - b. In accordance with AWS D1.1.
 - c. Length of field welds applied to the top and bottom chords of trusses shall not exceed 1/2 of the width of the steel member.
 3. When bolting trusses, bolt to supporting steel framework.
- D. Coating:
1. Deliver trusses coated or uncoated as indicated on the Drawings and specified.
 2. Where members are painted or coated in place, do not begin preparation or coating until units are in place; properly, completely, and permanently fastened, and accepted by the Engineer.
 3. Prepare, prime, and finish as specified in Section 09960 - High-Performance Coatings.
 4. Perform surface preparation and coating application under environmentally controlled field conditions, or in an off-site paint shop.

3.04 TOLERANCES

- A. Deviation from straight line between opposite ends of any installed truss: Maximum 3/8 inch in 10 feet.

3.05 REPAIR

- A. Do not install damaged trusses or accessories. Remove such materials from the site and replace with sound materials at no additional cost to the Owner.
- B. Repair rust spots and coatings damaged by handling, welding, or other erection and fastening processes.
- C. After erection, touch-up rust spots, connections, field welds, and abraded areas of members using specified coatings. Clean and prepare damaged areas. Apply coating at the same thickness as that applied before erection. Feather edges of repairs to provide a uniform appearance after repair.
 - 1. Clean and prepare surfaces using SSPC-SP 15 procedures.
 - 2. Apply coating of same product and color as member. Apply primer and finish coat(s).

3.06 FIELD QUALITY CONTROL

- A. Provide field quality control over the Work of this Section.
- B. Field tests and inspections:
 - 1. High-strength bolting:
 - a. Confirm use of specified bolts and nuts.
 - b. Pre-tensioned connections:
 - 1) Confirm that plies of the connected elements have been brought into firm contact by the tightened connection.
 - 2) Confirm bolts pretension using turn-of-the nut method, twist-off type tension controlled nut, or direct-tension indicator washer. Do not use calibrated wrench.
 - 2. Welding - Field welds.
 - a. Perform observations and testing in the presence of the Engineer.
 - b. Visual observation:
 - 1) Visually examine welds in accordance with AWS D1.1.
 - 2) Quality of welds and standards for acceptance shall be in accordance with AWS D1.1, "Visual Inspection Acceptance Criteria" Table.
 - c. Test results:
 - 1) Submit records of testing to Engineer within 24 hours after testing.
 - 3. After erection, observe installation for conformance with this specification.

3.07 FIELD QUALITY ASSURANCE

- A. Provide field quality assurance over the Work of this Section.
- B. Special inspections, special tests and structural observation:
 - 1. Provide as required by Section 01455 - Regulatory Quality Assurance.

- C. Field inspections:
 - 1. Required inspections:
 - a. Observe construction for conformance to the Contract Documents and the accepted Shop Drawings.
 - 1) Confirm that truss and accessory locations and tags (marks) match those indicated on the erection drawings.
 - 2) Confirm that trusses are installed in vertical alignment and without lateral sweep.
 - 3) Confirm that truss spacing conforms to erection drawings.
 - 4) Confirm that bridging lines, spacing, and connections/anchoring conform to erection drawings.
 - b. Visually inspect field bolting, including bolt tightness.
 - c. Visually inspect field welding using AWS certified welding inspectors in accordance with AWS D1.1.
 - 1) In accordance with AWS D1.1.
 - 2) Mark welds observed.
 - 2. Records of inspections:
 - a. Provide record of each inspection.
 - b. Submit copies to Engineer upon request.
- D. Field testing.

3.08 NON-CONFORMING WORK

- A. Remove and replace damaged and non-conforming work to the satisfaction of the Engineer.

END OF SECTION

ATTACHMENT A - INSTALLATION AND WELDING INSPECTION REPORT

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INSTALLATION AND WELDING INSPECTION REPORT

ELEMENTS INSPECTED	REF ⁽¹⁾	CONFORMS?		
		Yes	No	Comments ⁽²⁾
Member Installation:				
Truss and accessory locations, tags, and tagged end locations conform to erection drawings.	1			
Truss spacing conforms to erection drawings.	1			
TrussTrusses and accessories are installed in horizontal and vertical alignment and without lateral sweep.	1			
Truss bearing length on supporting members conforms to erection drawings and details.	1a			
Truss and accessory installations conform to specified tolerances.				
Bridging:				
Bridging locations, types (horizontal or diagonal), and member sizes conform to erection drawings.	1b			
Bridging connections to trusstrusses conforms to erection drawings.	1b			
Bridging connections to and terminations at ends/walls conforms to erection drawings.	1b			
Field Welding:				
Welds at locations indicated on erection drawings.				
Weld size and length as indicated on erection drawings.	1a			
Quality of welds complies with AWS D1.1 - "Visual Inspection Acceptance Criteria" Table	1a			
(Continued, next page)				
Field Bolting:				
Bolts at locations indicated on erection drawings.	1a			
Bolts, nuts and washers of sizes and materials specified.	1a			
Bolts tightened as specified. All plies of connection have been brought into firm contact.	1a			

SECTION 05310
STEEL DECKING

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Steel deck for floors and roofs, and associated accessories.

1.02 REFERENCES

- A. ASTM International (ASTM):
 - 1. A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- B. American Welding Society (AWS):
 - 1. D1.3 - Structural Welding Code - Sheet Steel.

1.03 SUBMITTALS

- A. Product data.
- B. Shop drawings.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Storage and protection:
 - 1. Store steel deck at the site stacked on platforms or pallets and covered with tarpaulins or other suitable weathertight covering.
 - 2. Do not use steel deck for storage or working platform.
 - 3. Remove damaged, unlabeled, untagged, rusty, and deteriorated steel deck material from the job site.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. One of the following or equal:
 - 1. ASC Profiles (Formerly IMSA Building Products and BHP).
 - 2. Verco Manufacturing Co.

2.02 MATERIALS

- A. Sheet steel: ASTM A653, G 90 minimum coating designation.

2.03 FABRICATION

- A. Steel deck shall be formed:
 - 1. So every sheet is identical and will register perfectly with adjacent sheets.

2. In accordance with building code as specified in Section 01410- Regulatory Requirements.
- B. Decking used with concrete fill shall be deformed to develop composite action between the deck and the concrete.
 - C. Furnish minimum gauge, deck thickness, section modulus, moment of inertia, and allowable diaphragm shear per foot of deck width that is not less than for type deck sections indicated on the Drawings.
 - D. Treat exposed roof deck with phosphate.
 - E. Furnish roof deck ready to receive field painting without further pretreatment. Paint exposed roof deck in accordance with Contract Documents.
 - F. Accessories:
 1. Furnish all accessories indicated on the Drawings or needed to completed work.
 2. Minimum required gauges:
 - a. Sump pans: 14 gauge.
 - b. All other accessories: 20 gauge unless otherwise indicated on the Drawings.
 - G. Welding and electrodes: In accordance with AWS D1.3.
 - H. Furnish roof decking in lengths to minimize number of splices.
 - I. Furnish steel deck complete, including cutting, shaping, fitting, drilling, welding, ridge plates, valley plates, reinforcing plates for openings, and miscellaneous pieces necessary for proper installation.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of conditions: Examine work in place to verify that it is satisfactory to receive the work of this Section. If unsatisfactory conditions exist, do not begin this work until such conditions have been corrected.

3.02 INSTALLATION

- A. Decking shall span over at least 3 spans wherever possible.
- B. Do not damage or overload roof deck during installation.
- C. Do not use steel deck for storage or as a working platform until sheets have been welded in position.
- D. Do not exceed maximum uniformly distributed load of 20 pounds per square foot.
- E. Install decking in straight and continuous rows as far as practicable, with ribs at right angles to supporting members.

- F. For each end of deck section, provide 3 inches minimum bearing on supports. For sections that abut each other, each piece shall bear a minimum of 3 inches on the support. This requires a 6 inch minimum flange width. For cases where the minimum bearing cannot be obtained, notify the Engineer.
- G. Electric arc weld deck sections to bearing plates, supports at butt joints, at intermediate supports, side supports, and at end supports as indicated on the Drawings. Do not burn through the deck. Remove all slag.
- H. Fasten the longitudinal joints between deck sections together by the method indicated on the Drawings.
- I. Neatly cut and fit openings in roof deck, and reinforce with structural steel members as indicated on the Drawings.
- J. Paint welds as specified.
- K. Install roof deck free of dents and bent members.
- L. Reinforce all holes and openings in steel deck as indicated on the Drawings.
- M. Piping, conduit, equipment, and other services: Do not hang from decking.
- N. Install all accessories required to complete work.
- O. Suspended items:
 - 1. Ceilings and ductwork:
 - a. Do not attach hangers to deck within the center 1/3 of span.
 - b. Only 1 hanger may be attached to any 1 rib within 1 span.
 - c. Attach wire hangers to decking with clips through hanger tabs.

3.03 REPAIR OF GALVANIZING AND COATING

- A. Touch-up damage to galvanized surfaces, including cut edges and holes, with zinc rich primer.
- B. Repair damage to factory-applied coating system in accordance with the manufacturer's printed recommendations.

3.04 CLEANUP

- A. After erection, remove weld spatter, grease, and oil from decking.

END OF SECTION

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SECTION 05500

METAL FABRICATIONS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
1. Aluminum grating stair tread.
 2. Aluminum stair nosing.
 3. Cast iron stop plank grooves.
 4. Concrete inserts.
 5. Handrails and guardrails.
 6. Ladders.
 7. Manhole frames and covers.
 8. Metal gratings.
 9. Metal tread plate.
 10. Preformed channel pipe supports.
 11. Stairs.
 12. Miscellaneous metals.
 13. Associated accessories to the above items.

1.02 REFERENCES

- A. Aluminum Association (AA):
1. DAF-45: Designations from Start to Finish.
 - a. M12-C22-A41.
- B. American Association of State Highway and Transportation Officials (AASHTO):
1. Standard Specifications for Highway Bridges.
- C. ASTM International (ASTM):
1. A36 - Standard Specification for Carbon Structural Steel.
 2. A48 - Standard Specification for Gray Iron Castings.
 3. A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded, and Seamless.
 4. A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 5. A240 - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels for General Applications.
 6. A276 - Standard Specification for Stainless Steel Bars and Shapes.
 7. A307 - Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 8. A380 - Standard Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems.
 9. A489 - Standard Specification for Carbon Steel Lifting Eyes.
 10. A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
 11. A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.

12. A635 - Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Hot-Rolled, Alloy, Carbon, Structural, High-Strength Low-Alloy, and High-Strength Low-Alloy with Improved Formability, General Requirements for.
 13. A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 14. A992 - Standard Specification for Structural Steel Shapes.
 15. B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 16. B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
 17. B308 - Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles.
 18. B429 - Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
 19. F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws and Studs.
 20. F3125 - Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi and 150 ksi Minimum Tensile Strength.
- D. American Welding Society (AWS):
1. A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
- E. National Association of Architectural Metal Manufacturers (NAAMM):
1. Metal Finishes Manual.
- F. Occupational Safety and Health Administration (OSHA).

1.03 DEFINITIONS

- A. Passivation: Removal of exogenous iron or iron compounds from the surface of a stainless steel by means of chemical dissolution resulting from treatment with an acid solution that removes the surface contamination but does not significantly affect the stainless steel itself.

1.04 SUBMITTALS

- A. Product Data:
1. Aluminum grating stair tread.
 2. Aluminum stair nosing.
 3. Cast iron stop plank grooves.
 4. Handrails and guardrails.
 5. Manhole frames and covers.
 6. Metal grating.
- B. Shop drawings:
1. Handrails and guardrails:
 - a. Including details on connection attachments, gates, kick plates, ladders, and angles.
 - b. Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.

- c. Include erection drawings, elevations, and details where applicable.
 - d. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
 - 2. Ladders.
 - 3. Metal grating.
 - 4. Metal tread plate.
 - 5. Stairs.
 - 6. Miscellaneous metals.
- C. Samples:
 - 1. Guardrails with specified finishes.
- D. Quality control submittals:
 - 1. Design data.
 - 2. Test reports:
 - a. Guardrails: 3 copies of certified tests performed by an independent testing laboratory certifying that guardrails meet current State and OSHA strength requirements.
 - b. Gratings:
 - 1) Grating manufacturers' calculations showing that gratings will meet specified design load, stress, and deflection requirements for each size grating for each span.
 - 2) Reports of tests performed.
 - c. Planks:
 - 1) Plank manufacturers' calculations showing that planks will meet specified load-bearing and deflection requirements for each size plank for each span.
 - 2) Reports of tests performed.

PART 2 PRODUCTS

2.01 MATERIALS

- A. General: Unless otherwise specified or indicated on the Drawings, structural and miscellaneous metals in accordance with the standards of the ASTM, including the following:
 - 1. Stainless steels are designated by type or series defined by ASTM.
 - 2. Where stainless steel is welded, use low-carbon stainless steel.

2.02 MANUFACTURED UNITS

- A. Aluminum grating stair tread:
 - 1. Manufacturers: One of the following or equal:
 - a. Harsco Industrial IKG, Aluminum Grating Stair Tread with Mebac® nosing.
 - b. McNichols Co., Type A-Standard with Corrugated Angle Nosing.
 - 2. Material: Welded aluminum grating tread with non-slip nosing and integral end plates for bolt on attachment to stair stringers.

3. Size:
 - a. Tread width: To equal tread spacing plus 1 inch minimum.
 - b. Tread length: Length to suit stringer-to-stringer dimension on the Drawings.
 - c. Depth: 1-3/4 inches.
 4. Bolts: Type 316 stainless steel.
- B. Aluminum stair nosing:
1. Manufacturers: One of the following or equal:
 - a. Wooster Products, Inc., Type 101 Nosing.
 - b. American Safety Tread Co., Inc., Style 801 Nosing.
 2. Material: Cast aluminum abrasive nosings with aluminum oxide granules integrally cast into metal, forming permanent, nonslip, long-wearing surface.
 3. For installation in cast-in-place stairs.
 4. Configuration: 4 inches wide, fabricated with integrally cast stainless steel anchors at approximately 12-inch centers. Length to extend within 3 inches of stair edge on each side.
- C. Cast iron stop plank grooves:
1. Manufacturers: One of the following or equal:
 - a. Neenah Foundry Co., R-7500 Series, Type A.
 - b. McKinley Iron Works, Type L.
 2. Size: 2-inch wide groove opening by 1-1/2 inch deep, unless otherwise indicated on the Drawings.
 3. Recess groove with the cast iron surface of the groove set flush with the concrete surface.
- D. Concrete inserts:
1. Concrete inserts for supporting pipe and other applications are specified in Section 15061 - Pipe Supports.
- E. Handrails and guardrails:
1. General:
 - a. Design and fabricate assemblies to conform to current local, State, and OSHA standards and requirements.
 - b. Coordinate layout of assemblies and post spacings to avoid conflicts with equipment and equipment operators:
 - 1) Indicate on the shop drawings locations of such equipment.
 - 2) Highlight locations where railings cannot be made continuous, and obtain Engineer's directions on how to proceed before fabricating or installing railings.
 2. Aluminum handrails and guardrails (nonwelded pipe):
 - a. Rails, posts, and fitting-assembly spacers:
 - 1) In accordance with ASTM B429, 6005, 6063 or 6105, minimum Schedule 40, extruded aluminum pipe of minimum 1.89-inch outside diameter and 0.14-inch wall thickness.
 - b. Kick plates: 6061 or 6105 aluminum alloy.
 - c. Fastenings and fasteners: As recommended or furnished by the manufacturer.

- d. Other parts: 6063 extruded aluminum, or F214 or F514.0 aluminum castings:
 - 1) Fabrications: In accordance with ASTM B209 or ASTM B221 extruded bars:
 - a) Bases: 6061 or 6063 extruded aluminum alloy.
 - 2) Plug screws or blind rivets: Type 305 stainless steel.
 - a) Other parts: Type 300 series stainless steel.
 - e. Finish of aluminum components:
 - 1) Anodized finish, 0.7 mil thick, applied to exposed surfaces after cutting. Aluminum Association Specification M12-C22-A41, mechanical finish non specular as fabricated, chemical finish-medium matte, anodic coating-clear Class I Architectural.
 - 2) Pretreat aluminum for cleaning and removing markings before anodizing.
 - f. Fabrication and assembly:
 - 1) Fabricate posts in single, unspliced pipe length.
 - 2) Perform without welding.
 - 3) Do not epoxy bond the parts.
 - 4) Maximum clear opening between assembled railing components as indicated on the Drawings.
 - g. Manufacturers: One of the following or equal:
 - 1) Moultrie Manufacturing Co., Wesrail.
 - 2) Golden Railings, Riveted System.
 - 3) Craneveyor Corp. Enerco Metals, C-V Rail.
3. Steel pipe handrails and guardrails:
- a. Schedule 40 black steel pipe with minimum 1.9-inch outside diameter, or larger where indicated on the Drawings.
 - b. Fabricate posts in single, unspliced pipe length.
 - c. Kick plates: Galvanized steel.
 - d. Attachment devices: Provide clip angles and other fasteners necessary for securing handrails and guardrails to other construction as indicated on the Drawings.
 - e. Continuously weld joints and grind smooth.
 - f. Bend rails to profile indicated on the Drawings, without sharp bends or flat spots. Rails shall be round after bending.
 - g. Neatly weld intersection of rails and posts, and grind surfaces smooth.
4. Guardrail gates:
- a. Supplied by guardrail manufacturer:
 - 1) Of same material, quality, and workmanship as specified for guardrail system in which they will be installed.
 - 2) Of design similar to that of handrail or railing system in which they will be installed.
 - b. Components: Gate frame, stainless steel self-closing device, hinges, gate stops, and durable self-locking type latch. Fabricate components in conformance with OSHA minimum strength requirements.
5. Fastenings and fasteners: As recommended or furnished by guardrail manufacturer for use with this system.

F. Ladders:

- 1. General:
 - a. Type: Safety type conforming to local, State, and OSHA standards as minimum. Furnish guards for ladder wells.

- b. Size: 18 inches wide between side rails of length, size, shape, detail, and location indicated on the Drawings.
 - 2. Aluminum ladders:
 - a. Materials: 6063-T5 aluminum alloy.
 - b. Rungs:
 - 1) 1-inch minimum solid square bar with 1/8-inch grooves in top and deeply serrated on all sides.
 - 2) Capable of withstanding 1,000 pound load without failure.
 - c. Side rails: Minimum 4-inch by 1/2-inch flat bars.
 - d. Finish of aluminum components:
 - 1) Anodized finish, 0.7 mil thick, applied to exposed surfaces after cutting. Aluminum Association Specification M12-C22-A41, mechanical finish non specular as fabricated, chemical finish-medium matte, anodic coating-clear Class I Architectural.
 - 2) Pretreat aluminum for cleaning and removing markings before anodizing.
 - e. Fabrication:
 - 1) Welded construction, of size, shape, location, and details indicated on the Drawings.
 - 2) For ladders over 20 feet high, furnish standard ladder cages or fall prevention system designed in accordance with State and OSHA requirements.
 - f. Fall prevention system: Include but not limit to railing, brackets, clamps, 2 sleeves, and 2 belts, satisfying OSHA safe climbing requirements:
 - 1) Manufacturers: One of the following or equal:
 - a) North Consumer Products, Saf-T-Climb.
 - b) Swager Communications, Climbers Buddy System.
- G. Manhole frames and covers:
- 1. Material: Gray iron castings, in accordance with ASTM A48, Class 30-B.
 - 2. Type: Heavy-duty traffic type, with combined minimum set weight of 265 pounds.
 - 3. Machine horizontal and vertical bearing surfaces to fit neatly, with easily removable cover bearing firmly in frame without rocking.
 - 4. Frame:
 - a. Bottom flange type.
 - b. Approximately 4-1/2 inches frame height.
 - c. Dimensions as indicated on the Drawings.
 - 1) Minimum inside clear dimension may not be smaller than nominal diameter minus 2 inches.
 - 5. Cover:
 - a. Skid-resistant grid pattern design stamped with name of utility service provided by manhole, such as "ELECTRICAL," "SEWER," "TELEPHONE," or "WATER."
 - b. Solid type without ventilation holes.
 - 6. Finish: Unpainted.
- H. Metal gratings:
- 1. General:
 - a. Fabricate grating to cover areas indicated on the Drawings.
 - b. Unless otherwise indicated on the Drawings, grating over an opening shall cover entire opening.

- c. Make cutouts in grating where required for equipment access or protrusion, including valve operators or stems, and gate frames.
 - d. Band ends of grating and edges of cutouts in grating:
 - 1) End banding: 1/4 inch less than height of grating, with top of grating and top edge of banding flush.
 - 2) Cutout banding: Full-height of grating.
 - 3) Use banding of same material as grating.
 - 4) Panel layout: Enable installation and subsequent removal of grating around protrusions or piping.
 - 5) Openings 6 inches and larger: Lay out grating panels with edges of 2 adjacent panels located on centerline of opening.
 - 6) Openings smaller than 6 inches: Locate opening at edge of single panel.
 - 7) Where an area requires more than 1 grating section to cover area, clamp adjacent grating sections together at 1/4-points with fasteners acceptable to Engineer.
 - 8) Fabricate steel grating sections in units weighing not more than 50 pounds each.
 - 9) Fabricate aluminum grating sections in units of weighing not more than 50 pounds each.
 - 10) Gaps between adjacent grating sections shall not be more than the clear spacing between bearing bars.
 - e. When requested by Engineer, test 1 section of each size grating for each span length involved on the job under full load:
 - 1) Furnish a suitable dial gauge for measuring deflections.
 - f. Grating shall be aluminum, unless otherwise specified or indicated on the Drawings.
2. Aluminum grating:
- a. Material for gratings, shelf angles, and rebates: 6061-T6 or 6063-T6 aluminum alloy, except crossbars may be 6063-T5 aluminum alloy.
 - b. Shelf angle concrete anchors: Type 304 or Type 316 stainless steel.
 - c. Grating rebate rod anchors: 6061-T6 or 6063-T6 aluminum alloy.
 - d. Bar size and spacing: As determined by manufacturer to enable grating to support design load.
 - e. Design live load: A minimum of 100 pounds per square foot uniform live load on entire grating area, but not less than the live load indicated on the Drawings for the area where grating is located.
 - f. Maximum fiber stress for design load: 12,000 pounds per square inch.
 - g. Maximum deflection due to design load: 1/240 of grating clear span.
 - h. Maximum spacing of main grating bars: 1-1/8 inches clear between bars.
 - i. Minimum grating height: 1-1/2 inches.
 - j. Manufacturers: The following or equal:
 - 1) Harsco Industrial IKG, Swaged Aluminum I-Bar with striated finish.
3. Aluminum grating planks:
- a. Materials: Meet requirements previously specified for aluminum grating.
 - b. Fabrication:
 - 1) Meet requirements previously specified for aluminum grating.
 - c. Have unpunched surface with cross hatched anti-skid surface.
 - d. Minimum weight of 3-1/4 pounds per square foot.
 - e. Provide 1 inch diameter hole with smooth edges at each end for each plank.

- f. Furnish planks in 2 foot widths.
 - g. Manufacturers: The following or equal:
 - 1) Harsco Industrial IKG, Heavy Duty Aluminum Plank Grating HD-P.
 - h. Planks shall not lock with adjacent planks allowing the removal of individual planks without disturbing the adjacent planks.
4. Steel gratings:
- a. Hot-dip galvanized in accordance with ASTM A123.
 - b. Bar size and spacing: As determined by the manufacturer to support design load.
 - c. Design live load: A minimum of 100 pounds per square foot uniform live load on the entire area of the grating area, but not less than the live load indicated on the Drawings for the area where the grating is located.
 - d. Maximum fiber stress for design load: 18,000 pounds per square inch.
 - e. Maximum deflection under design load: 1/240 of grating clear span.
 - f. Bar spacing: Maximum of 1-1/8 inches clear between bars.
 - g. Manufacturers: The following or equal:
 - 1) Harsco Industrial IKG, IKG Weldforged.
5. Heavy-duty steel grating:
- a. Heavy-duty type, fabricated from structural steel and designed in accordance with AASHTO Standard Specifications for Highway Bridges, using H-20 loading.
 - b. Hot-dip galvanized after fabrication in accordance with ASTM A123.
 - c. Manufacturers: One of the following or equal:
 - 1) Reliance Steel Products Co., Heavy-Duty Steel Grating.
 - 2) Seidelhuber Metal Products, Inc., equivalent product.
- I. Metal tread plate:
- 1. Plate having a raised figured pattern on 1 surface to provide improved traction.
- J. Preformed channel pipe supports:
- 1. Preformed channel pipe supports for pipe supports and other applications are specified in Section 15062 - Preformed Channel Pipe Support System.
- K. Stairs:
- 1. Aluminum stairs:
 - a. Stringers: 6061-T6 aluminum alloy.
 - b. Stair treads:
 - 1) Aluminum of same type specified under Aluminum Grating.
 - 2) Of sizes indicated on the Drawings, and 1-3/4 inch minimum depth with cast abrasive type safety nosings.
 - c. Provide a vertical close piece between each riser. Fabricate, install, and fasten close pieces as indicated on the Drawings.
 - d. Handrails and guardrails: Aluminum pipe specified under Aluminum Handrails and Guardrails (Nonwelded Pipe).
 - e. Fasteners: Type 304 or Type 316 stainless steel.
 - 2. Steel stairs:
 - a. Ships ladders shall conform to local, State, and OSHA as minimum.
 - b. Stringers: Structural steel channels or plates.
 - c. Treads: Open type attached to stringers with support angles and clips. Manufacturers: One of the following or equal:
 - 1) Harsco Industrial IKG, "Welded Tread" with Algrip® nosing.
 - d. Railings: Steel pipe, sized as indicated on the Drawings.

- e. Anchors: Welded or bolted brackets designed for support and anchorage at top and bottom.
 - f. Finish: Prime paint finish for interior locations.
- L. Miscellaneous aluminum:
- 1. Fabricate aluminum products, not covered separately in this Section, in accordance with the best practices of the trade and field assemble by riveting or bolting.
 - 2. Do not weld or flame cut.
- M. Miscellaneous cast iron:
- 1. General:
 - a. Tough, gray iron, free from cracks, holes, swells, and cold shuts.
 - b. Quality such that hammer blow will produce indentation on rectangular edge of casting without flaking metal.
 - c. Before leaving the foundry, clean castings and apply 16-mil dry film thickness coating of coal-tar epoxy, unless otherwise specified or indicated on the Drawings.
- N. Miscellaneous stainless steel:
- 1. Provide miscellaneous stainless steel items not specified in this Section as indicated on the Drawings or specified elsewhere.
 - a. Fabricate and install in accordance with the best practices of the trade.
 - 2. Cleaning and passivation:
 - a. Following shop fabrication of stainless steel members, clean and passivate fabrications.
 - b. Finish requirements: Remove free iron, heat tint oxides, weld scale and other impurities, and obtain a passive finished surface.
 - c. Provide quality control testing to verify effectiveness of cleaning agents and procedures and to confirm that finished surfaces are clean and passivated.
 - 1) Conduct sample runs using test specimens with proposed cleaning agents and procedures as required to avoid adverse effects on surface finishes and base materials.
 - d. Pre-clean, chemically descale (pickle), and final clean fabrications in accordance with the requirements of ASTM A380 to remove deposited contaminants before shipping.
 - 1) Passivation by citric acid treatment is not allowed.
 - a) If degreasing is required before cleaning to remove scale or iron oxide, cleaning (pickling) treatments with citric acid are permissible; however, these treatments shall be followed by inorganic cleaners such as nitric-hydrofluoric acid.
 - 2) Provide acid descaling (pickling) in accordance with Table A1.1 of Annex A1 of ASTM A380.
 - 3) After pickling, final cleaning of stainless steel shall conform to Part II of Table A2.1 of Annex A2 of ASTM A380.
 - e. After cleaning, inspect using methods specified for "gross inspection" in ASTM A380.
 - f. Improperly or poorly cleaned and passivated materials shall not be shipped and will not be accepted at the job site.

- O. Miscellaneous structural steel:
 - 1. Provide miscellaneous steel items not specified in this Section as indicated on the Drawings or specified elsewhere.
 - a. Fabricate and install in accordance with the best practices of the trade.
- P. Isolating sleeves and washers:
 - 1. As indicated on the Drawings and as specified in Section 05190 - Mechanical Anchoring and Fastening to Concrete and Masonry.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of conditions:
 - 1. Examine work in place to verify that it is satisfactory to receive the work of this Section.
 - 2. If unsatisfactory conditions exist, do not begin this work until such conditions have been corrected.

3.02 INSTALLATION

- A. General:
 - 1. Install products as indicated on the Drawings, and in accordance with shop drawings and manufacturer's printed instructions, as applicable except where specified otherwise.
 - 2. Interface between materials:
 - a. Dissimilar metals: Where steel comes in contact with dissimilar metals (aluminum, stainless steel, etc.), separate or isolate the dissimilar metals.
 - 1) Make application so that the isolating or protective barrier is not visible in the completed construction.
 - 2) Isolating sleeves and washers: As specified in Section 05190 - Mechanical Anchoring and Fastening to Concrete and Masonry.
 - b. Aluminum in contact with concrete or masonry: Coat aluminum surfaces as specified in Section 09960 - High Performance Coatings.
 - c. Aluminum in contact with concrete or masonry.
- B. Aluminum stair nosing:
 - 1. Install stair nosings on treads of concrete stairs, including top tread on upper concrete slab.
 - 2. Omit stair nosings where concrete is submerged.
 - 3. Cast stair nosings in fresh concrete, flush with tread and riser faces. Install nosing in center of step.
- C. Cast iron stop plank grooves:
 - 1. Recess stop plank grooves with cast iron surfaces of groove set flush with concrete surface.
- D. Handrails and guardrails:
 - 1. General:
 - a. Fasten pipe rails to fittings with Series 300 stainless steel pop rivets or flush set screws.

- b. Make pipe cuts clean and straight, free of burrs and nicks, and square and accurate for minimum joint-gap.
 - c. Drill and countersink holes to proper size, as required for a tight flush fit of screws and other component parts.
 - d. Space attachment brackets as indicated in the manufacturer's instructions.
2. Aluminum pipe handrails and guardrails:
- a. During construction, keep exterior surfaces of handrails and guardrails covered with minimum 0.4 millimeters of heat shrink polyethylene film.
 - b. Do not remove protective film before handrails and guardrails have been accepted by Engineer nor before other work in proximity of handrails and guardrails has been completed.
 - c. Discontinue handrails and guardrails at lighting fixtures.
 - d. Provide 1/8-inch diameter weep hole at base of each post.
 - e. Space posts as indicated on the Drawings.
 - f. Anchor posts into concrete by grouting posts into formed holes in concrete, into stainless steel sleeves cast in concrete; or bracket mount to face of concrete surfaces as specified and indicated on the Drawings.
 - g. Space rails as indicated on the Drawings.
 - h. Make adequate provision for expansion and contraction of kick plates and rails.
 - 1) Make provisions for removable sections where indicated on the Drawings.
 - i. Make lower rails a single, unspliced length between posts, or continuous.
 - j. Make top rails continuous whenever possible, and attach single, unspliced lengths to 3 posts minimum.
 - k. Draw up fasteners tight with hand wrench or screw driver.
 - l. Space attachment brackets as indicated on shop drawings or in manufacturer's installation instructions.
 - m. Completed installation shall have handrails and railings rigid and free of play at joints and attachments.
 - n. Protect handrail and guardrail finish from scratches, gouges, dents, stains, and other damage.
 - o. Replace damaged or disfigured handrails and guardrails with new.
 - p. Shortly before final acceptance of the work, and after removal of protective polyethylene film, clean handrails and guardrails with mild detergent or with soap and water.
 - 1) After cleaning, thoroughly rinse handrails and guardrails and wipe with soft cloth.
 - q. Erect guardrail straight, level, plumb, and true to the positions as indicated on the Drawings. Correct deviations from true line of grade, which are visible to the eye.
3. Steel pipe handrail and guardrail:
- a. Anchor posts into concrete by grouting posts into galvanized steel sleeves embedded in concrete as indicated on the Drawings.
 - 1) Do not cut reinforcing bars in concrete.
 - 2) Where required to fasten guardrail to other construction, fasten as indicated on the Drawings.
4. Guardrail gates:
- a. Install gate to be a vertical plane with the guardrail when in the closed position.

- b. Install hinges so that each gate can swing 180 degrees from the closed position to the fully open position.
- c. Install so that the gates swing to the walkway side of the guardrail only.
 - 1) Install gate stops on the stationary railing posts to prohibit gates from swinging in the wrong direction.
- d. Install gate frames, hinges, stops, and latches in conformance with OSHA minimum strength requirements.

E. Ladders:

- 1. Secure to supporting surface with bent plate clips providing minimum 8 inches between supporting surface and center of rungs.
- 2. Where exit from ladder is forward over top rung, extend side rails 3 feet 3 inches minimum above landing, and return the rails with a radius bend to the landing.
- 3. Where exit from ladder is to side, extend ladder 5 feet 6 inches minimum above landing and rigidly secure at top.
- 4. Erect rail straight, level, plumb, and true to position indicated on the Drawings:
 - a. Correct deviations from true line or grade which are visible to the eye.

F. Manhole frames and covers:

- 1. Installation: As specified in Section 02084 - Precast Drainage Structures.

G. Metal gratings:

- 1. General:
 - a. Allow 1/8-inch maximum clearance between ends of grating and inside face of vertical leg of shelf angles.
 - b. Horizontal bearing leg of shelf angles shall be 2 inches minimum.
 - c. Install aluminum plate or angles where necessary to fill openings at changes in elevation and at openings between equipment and grating.
 - d. Install angle stops at ends of grating.
 - e. Installed grating shall not slide out of rebate or off support.
 - f. Weld stops in place, unless otherwise specified or indicated on the Drawings.
 - g. Top surfaces of grating sections adjacent to each other shall lie in same plane.
- 2. Aluminum grating:
 - a. Aluminum grating: Support on aluminum shelf angles or rebates.
- 3. Aluminum grating planks:
 - a. Support and install planks as specified for aluminum grating.
- 4. Steel grating:
 - a. Support on hot-dip galvanized structural steel shelf angles or rebates.
- 5. Heavy-duty steel grating:
 - a. Support on hot-dip galvanized structural steel rebates embedded and anchored in concrete.
 - b. Use for roadways, traffic areas, and where indicated on the Drawings.

H. Stairs:

- 1. General:
 - a. Install guard railings around stair wells as indicated on the Drawings or specified.

- I. Stainless Steel:
 - 1. Welding:
 - a. Passivate field-welded surfaces:
 - 1) Provide cleaning, pickling and passivating as specified in this Section.
 - 2) Clean using Derustit Stainless Steel Cleaner, or equal.

END OF SECTION

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SECTION 06100

ROUGH CARPENTRY

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes wall and roof sheathing; miscellaneous framing and sheathing; telephone and electrical panel back boards; and concealed wood blocking for support of toilet and bath accessories wall cabinets, wood trim, and treated wood blocking and curbs in roof assemblies.
- B. Related Sections:
 - 1. Section 07415 – Metal Roofing: Wood curbs and cants. Section 07600 – Flashing and Sheet Metal: Wood curbs, cants, and nailing strips. Section 07714 – Gutters and Downspouts: Wood Curbs and nailing strips. Section 08410 – Metal Framed Storefronts: Openings to receive wood blocking. Section 10615 – Demountable Partitions: Openings to receive wood blocking. Section 10810 – Toilet Accessories: Products requiring wood blocking.

1.02 REFERENCES

- A. American Wood-Preservers' Association:
 - 1. AWPA M4 - Standard for the Care of Preservative-Treated Wood Products.
 - 2. AWPA U1 - Use Category System: User Specification for Treated Wood.
- B. ASTM International:
 - 1. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - 2. ASTM B695 - Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel
 - 3. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 4. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
 - 5. ASTM F1667 - Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.
- C. California Department of Health Services:
 - 1. CA/DHS/EHLB/R-174 - Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers, including 2004 Addenda.
- D. Forest Stewardship Council:
 - 1. FSC Guidelines - Forest Stewardship Council Guidelines.
- E. Green Seal:
 - 1. GS-36 - Aerosol Adhesives.

- F. National Lumber Grades Authority:
 - 1. NLGA - Standard Grading Rules for Canadian Lumber.
- G. Northeastern Lumber Manufacturers Association:
 - 1. NELMA - Standard Grading Rules for Northeastern Lumber.
- H. The Redwood Inspection Service:
 - 1. RIS - Standard Specifications for Grades of California Redwood Lumber.
- I. South Coast Air Quality Management District:
 - 1. SCAQMD Rule 1168 - Adhesive and Sealant Applications.
- J. Southern Pine Inspection Bureau:
 - 1. SPIB - Standard Grading Rules for Southern Pine Lumber.
- K. U.S. Department of Commerce National Institute of Standards and Technology:
 - 1. DOC PS 1 - Construction and Industrial Plywood.
 - 2. DOC PS 2 - Performance Standard for Wood-Based Structural-Use Panels.
 - 3. DOC PS 20 - American Softwood Lumber Standard.
- L. West Coast Lumber Inspection Bureau:
 - 1. WCLIB - Standard Grading Rules for West Coast Lumber.
- M. Western Wood Products Association:
 - 1. WWPA G-5 - Western Lumber Grading Rules.

1.03 SUBMITTALS

- A. Section 01300 - Submittals: Requirements for submittals.
- B. Product Data: Submit technical data on insulated sheathing, wood preservative materials, and application instructions.
- C. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.04 SUSTAINABLE DESIGN SUBMITTALS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
 - 1. Materials Resources Certificates:
 - a. Certify recycled material content for recycled content products.
 - b. Certify lumber is harvested from Forest Stewardship Council Certified well managed forest.
 - 2. Indoor Air Quality Certificates:
 - a. Certify volatile organic compound content for each interior adhesive and sealant and related primer.
 - b. Certify each composite wood product contains no added urea-formaldehyde resins.

1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with the following:
 - 1. Lumber Grading Agency: Certified by DOC PS 20.
 - 2. Wood Structural Panel Grading Agency: Certified by EWA - The Engineered Wood Association.
 - 3. Lumber: DOC PS 20.
 - 4. Wood Structural Panels: DOC PS 1 or DOC PS 2.
- B. Surface Burning Characteristics:
 - 1. Fire Retardant Treated Materials: Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.
- C. Apply label from agency approved by authority having jurisdiction to identify each preservative treated and fire retardant treated material.

PART 2 PRODUCTS

2.01 SUSTAINABILITY CHARACTERISTICS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design compliance.
- B. Materials and Resources Characteristics:
 - 1. Recycled Content Materials: Furnish materials with maximum available recycled content.
 - 2. Certified Wood Materials: Furnish wood materials certified in accordance with FSC Guidelines.
- C. Indoor Environmental Quality Characteristics:
 - 1. Interior Adhesives: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.
 - 2. Interior Aerosol Adhesives: Maximum volatile organic compound content in accordance with GS-36.
 - 3. Interior Composite Wood Products: Contain no added urea-formaldehyde resins.

2.02 WOOD

- A. Minimum lumber grade requirements for framing and sheathing:

Classification	Nominal Size	Species and Minimum Grade
Studs	2 by 3, 2 by 4	Southern Pine Number 2 or construction
	2 by 6, 2 by 8	Southern Pine Number 2
Roof Joists	2 by 6 through 2 by 14	Southern Pine Number 2
Floor Joists and Planking	2 by 6 through 2 by 14	Southern Pine Number 2
Headers, Beams, and Stringers	4 by 4 through 4 by 14	Southern Pine Number 1

Classification	Nominal Size	Species and Minimum Grade
	6 by 6 through 6 by 14	Southern Pine Number 1
Posts and Timbers	6 by 6 and larger	Southern Pine Number 1
Boards	1 by	Southern Pine Construction
Framing Lumber	All sizes	Southern Pine Number 2
Blocking and Bridging	2 by 3 through 2 by 14	Southern Pine Number 3
Miscellaneous	All sizes	Southern Pine Number 2

- B. Species shall be as specified, or any combination of species allowed by grading rules.
- C. Lumber 4 inches thick and less: Seasoned or kiln-dried with maximum 19 percent moisture.
- D. Lumber thicker than 4 inches: Seasoned to minimize warping and twisting.
- E. Lumber surfaces: Surfaced four sides (S4S), unless otherwise specified or indicated on the Drawings.
- F. Lumber shall be free of bow, warp, or twist. Pieces with serious defects will be discarded regardless of grading.
- G. Sills, cants, and nailers for fascia for roofing: Preservative pressure-treated Number 2 or better Southern Pine.
- H. Roof nailers: Use preservative pressure-treated Number 2 or better Southern Pine nailers for gravel stops at edges of roof and at roof expansion joints. Match thickness of nailers and roof insulation.

2.03 PLYWOOD

- A. Plywood:
 - 1. DOC PS 1-07 for softwood plywood.
- B. Plywood with edges or surfaces permanently exposed to weather: Exterior type with exterior type glue, Grade A-C.
- C. Plywood roof sheathing: Exterior type with exterior type glue, of thickness and grade as indicated on the Drawings.
- D. Plywood sheathing exposed at overhangs: Exterior type plywood with exterior type glue, Grade A-C or better.
- E. Miscellaneous plywood: Exterior type plywood of thickness indicated on the Drawings, Grade A-C, or as otherwise indicated on the Drawings.
- A. Plywood for roof diaphragms and shear walls: As indicated on the Drawings. When thicknesses given are not readily available, use the next thicker size available of the grade specified.

2.04 ROUGH HARDWARE

A. Fasteners:

1. Nails: ASTM F 1667 common wire nails or spikes with full head.
2. Bolts, nuts, and studs: ASME B18.2.1, hot-dip galvanized.
3. Washers: Hot-dip galvanized square or round steel plate washers, or malleable iron washers with following dimensions:
 - a. Hot-dip galvanized square steel washers:

Bolt Diameter	Washer Dimensions
1/2 inch	2-1/2 by 2-1/2 by 1/4 inches
5/8 inch	2-1/2 by 2-1/2 by 1/4 inches
3/4 inch	2-3/4 by 2-3/4 by 5/16 inches
7/8 inch	3-1/4 by 3-1/4 by 5/16 inches
1 inch	3-3/4 by 3-3/4 by 3/8 inches

- b. Hot-dip galvanized round steel washers:

Bolt Diameter	Washer Dimensions
1/2 inch	2-1/2 inch diameter by 1/4 inch
5/8 inch	2-3/4 inch diameter by 1/4 inch
3/4 inch	3 inch diameter by 5/16 inch
7/8 inch	3-1/2 inch diameter by 3/8 inch
1 inch	4 inch diameter by 7/16 inch

- c. Round malleable iron washers:

Bolt Diameter	Washer Dimensions
1/2 inch	2-1/2 inch diameter by 1/4 inch
5/8 inch	2-3/4 inch diameter by 5/16 inch
3/4 inch	3 inch diameter by 7/16 inch
7/8 inch	3-1/2 inch diameter by 7/16 inch
1 inch	4 inch diameter by 1/2 inch

4. Lag screws: ASME B18.2.1, hot-dip galvanized.
5. Wood screws: ASME B18.6.1.
6. Nails, screws, bolts, plates, and other fasteners exposed to weather or on building exteriors shall be hot-dip galvanized or of Series 300 stainless steel.
7. Anchor bolts, concrete anchors, flush shells, and powder actuated fasteners: As specified in Section 720S.
8. Sheet metal connectors:
 - a. Manufacturers: One of the following or equal:
 - 1) Simpson Strong-Tie Company, Inc.
 - 2) USP Structural Connectors.
 - b. Material: Sheet steel, hot-dip galvanized after fabrication. Material in contact with Pressure Treated Timber shall be stainless steel when available or extra heavy hot dip galvanized when stainless is not available.

- c. Model numbers: As indicated on the Drawings.
 - d. Nails, typical: Common, hot-dip galvanized.
 - e. Nails, joist hanger: Special, hot-dip galvanized, providing full building code as specified in Section 01410 - Regulatory Requirements, lateral load resistance values for common nails.
 - f. Use manufacturer's recommended attachment hardware in all holes available. Hardware shall match the material of the connector.
- B. Miscellaneous hardware:
- 1. Clamps, expansion screws, anchors, and plates: Standard products of established manufacturers of proper size and strength to adequately fasten, support, and maintain members in place.
 - 2. Hardware exposed to weather or on building exteriors: Hot-dip galvanized.
- C. Building paper: ASTM D 226; unperforated; No. 15 unless otherwise indicated.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that conditions are satisfactory for installation of products.

3.02 GENERAL

- A. Notch, cope, and miter meeting members so meeting members have full bearing without overcutting or undercutting.
- B. Accurately cut, fit, and frame lumber.

3.03 SILLS AND PLATES

- A. Install 2 layers of building paper under sills and members fasten to concrete or masonry.
- B. Secure sills to foundation as indicated on the Drawings. When not indicated on the Drawings, anchor sills with 1/2-inch diameter hot-dip galvanized anchor bolts at 2 foot 8 inch centers and within a minimum of 6 inches from each end of each member.
- C. Set plates on top of masonry and concrete walls level and in same plane.
- D. Anchor plates to masonry or concrete with anchor bolts of size and spacing indicated on the Drawings. Install anchor bolt within 6 inches of member ends.
- E. Use cement grout, when necessary, to assure full bedding and leveling of plates.

3.04 WALLS

- A. Erect walls plumb and true to line.
- B. Frame walls and partitions with studs of sizes and spacing indicated on the Drawings and at not greater than 16 inches on center.

- C. Provide double studs at openings and triple studs at corners.
- D. Provide double plates at top of wall studs, arranging to form continuous horizontal ties. Splice individual plates and stagger ends of double plates.
- E. Provide two 2-by-6 lintels for openings up to 48 inches and two 2-by-8 lintels for openings from 48 inches to 72 inches.
- F. Frame openings for large pipes and ducts and for receiving recessed Work in partitions without cutting structural members.
- G. Place nailing blocks and backing necessary for attachment of ground, trim, fixtures, and miscellaneous items. Cut, fur, and install backing required for plumbing and heating pipes, fixtures, and electrical work.
- H. Provide fire retardant pressure-treated wood within metal-framed partitions and furring.
- I. Provide blocking for attaching paneling, trim, and similar items to framing.
- J. Do not cut wood beams or joists and plates in bearing walls for passage of pipes.
- K. Coordinate requirements for sleepers for mechanical equipment and curb openings with work of other Sections for locations and sizes.

3.05 ROUGH HARDWARE

- A. Provide nailing as indicated on the Drawings or in accordance with Fastening Schedule specified in building code, as specified in Section 01410 - Regulatory Requirements, whichever is more stringent. Do not use box and sinker nails.
- B. Install bolts and other fastenings as indicated on the Drawings or in accordance with building code as specified in Section 01410 - Regulatory Requirements, whichever is more stringent.
- C. Prebore nail holes where required to avoid splitting of wood members. Remove and replace split pieces.
- D. Prebore holes for screws and lag screws, then screw into place. When wood screws and lag screws are defective because they have been driven into place with hammer, replace wood members involved with new members.
- E. Drill holes for bolts 1/32-inch larger than bolt shank unless otherwise indicated on the Drawings.
- F. Perform final bolting after structural members have been properly aligned.
- G. Place washers under heads of bolts and nuts and heads of lag screws bearing on wood. Align exposed bolts.
- H. Power nailing will be permitted where nails are as specified and provided installation does not mar or damage wood members. Nails shall have full head. Do not overdrive nails.

- I. Drive nail heads for plywood diaphragms flush with plywood surface. Where nails have been overdriven in plywood panel, remove and replace plywood, nails, and damaged supporting members.
- J. Use common nails unless otherwise indicated on the Drawings.

END OF SECTION

SECTION 06410

CUSTOM CASEWORK

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Custom-fabricated cabinet units; counter tops; cabinet hardware; preparation for installing utilities in cabinets; and shop finishing.

1.02 REFERENCES

- 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:
 - 1. D1037 - Standard Test Methods for Evaluating Properties of Wood-Base Fiber and Particle Panel Materials.
- C. AWI (Architectural Woodwork Institute) - AWI 400A-S-1, AWI 400A-S-2, AWI 400A-S-3, AWI 400A-S-4, AWI 400A-S-5, AWI 400A-S-6, AWI 400A-S-7, AWI 400A-S-8, AWI 400A-T-1, AWI 400A-T-2, Quality Standards.
- D. BHMA A156.9 - American National Standard for Cabinet Hardware.
- E. NIST PS 20 - American Softwood Lumber Standard.
- F. FS MM-L-736 - Lumber, Hardwood.
- G. FS MMM-A-130 - Adhesive, Contact.
- H. Forest Stewardship Council (FSC): FSC Guidelines.
- I. Green Seal: GS-36 - Aerosol Adhesives.
- J. HPMA (Hardwood Plywood Manufacturers Association). HP - American Standard for Hardwood and Decorative Plywood.
- K. NEMA (National Electric Manufacturers Association) LD3 - High Pressure Decorative Laminates.
- L. NHLA (National Hardwood Lumber Association).
- M. PS 1 - Construction and Industrial Plywood.
- N. PS 20 - American Softwood Lumber Standard.
- O. South Coast Air Quality Management District:
 - 1. SCAQMD Rule 1168 - Adhesive and Sealant Applications.

- P. Woodwork Institute:
 - 1. WI - Manual of Millwork.

1.03 SUBMITTALS

- A. Submit under provisions of Section 01300 – Submittals: Requirements for submittals.
- B. Shop Drawings: Indicate materials, component profiles and elevations, assembly methods, joint details, fastening methods, accessory listings, hardware location and schedule of finishes.
- C. Product Data: Provide data for hardware accessories, cabinet body material, and plastic laminate.
- D. Samples:
 - 1. Submit two 8 by 10 inch size samples illustrating cabinet finish and core.
 - 2. Submit two 8 by 10 inch size samples illustrating countertop finish and core.

1.04 SUSTAINABLE DESIGN SUBMITTALS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
 - 1. Materials Resources Certificates:
 - a. Certify recycled material content for recycled content products.
 - b. Certify lumber is harvested from Forest Stewardship Council Certified well managed forest.
 - 2. Indoor Air Quality Certificates:
 - a. Certify volatile organic compound content for each interior adhesive and sealant and related primer.
 - b. Certify each composite wood product contains no added urea-formaldehyde resins.

1.05 QUALITY ASSURANCE

- A. Perform exposed work to custom grades and concealed work to custom grade in accordance with “Quality Standards” of the Architectural Woodwork Institute (AWI).
- B. Maintain one copy of each document on site.

1.06 DELIVERY, STORAGE, AND PROTECTION

- A. Protect work from moisture damage .

1.07 PROJECT CONDITIONS

- A. Environmental Requirements:
 - 1. During and after installation of work of this section, maintain the same temperature and humidity conditions in building spaces as will occur after occupancy.

- B. Field Measurements:
 - 1. Verify that field measurements are as indicated on shop drawings.
- C. Coordination:
 - 1. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.
- D. Coordinate the work with plumbing rough-in, electrical rough-in and installation of associated and adjacent components.

PART 2 PRODUCTS

2.01 SUSTAINABILITY CHARACTERISTICS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design compliance.
- B. Materials and Resources Characteristics:
 - 1. Recycled Content Materials: Furnish materials with maximum available recycled content.
 - 2. Certified Wood Materials: Furnish wood materials certified in accordance with FSC Guidelines.
- C. Indoor Environmental Quality Characteristics:
 - 1. Interior Adhesives: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.
 - 2. Interior Aerosol Adhesives: Maximum volatile organic compound content in accordance with GS-36.
 - 3. Interior Flat and Non-Flat Paints: Maximum volatile organic compound content in accordance with GS-11.
 - 4. Interior Composite Wood Products: Contain no added urea-formaldehyde resins.

2.02 WOOD MATERIALS

- A. Softwood Lumber: PS 20; Grade II in accordance with AWI standards; moisture content of 6- percent maximum.
- B. Hardwood Lumber: FS MM-L-736; Grades I and II in accordance with AWI; Birch species, quarter sawn.

2.03 SHEET MATERIALS

- A. Strawboard MDF: Renewable agricultural fiber board conforming to ANSI A208.1 standard for industrial grade particleboard and meets ASTM D1037 protocols for mechanical and physical properties.
 - 1. Interior Composite Wood and Agrifiber Products: Contain no added urea-formaldehyde resins.

2.04 LAMINATE MATERIALS

- A. Manufacturers:
 - 1. Wilsonart.
 - 2. Nevamar.
 - 3. Formica.
 - 4. Or approved equal.

- B. Plastic Laminates:
 - 1. NEMA LD #, GP - 50 general purpose type, for horizontal surfaces and vertical surfaces, color as selected by Architect from full line of manufacturer's standard colors.
 - a. AWI.040 inch thick for vertical applications and AWI.050 inch thick for horizontal applications.
 - b. Recycled Content: Minimum 10 percent Post-Consumer.
 - 2. No added urea-formaldehyde.

2.05 ACCESSORIES

- A. Adhesives: FS MMM-A-130 contact adhesive; type recommended by laminate manufacturer to suit application.
 - 1. Interior Adhesives: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.
 - 2. Interior Aerosol Adhesives: Maximum volatile organic compound content in accordance with GS-36.

- B. Fasteners: Size and type to suit application.

- C. Bolts, nuts, washers, lags, pins and screws of size and type to suit application. Standard finish in concealed locations and US 26 finish in exposed locations.

- D. Concealed Joint Fasteners: Threaded steel.

2.06 HARDWARE

- A. Hardware: Schedule only indicates major components. All accessories and miscellaneous hardware pieces required for a complete and functional operation are required whether or not specifically indicated.
 - 1. Shelf Supports: Knape & Vogt, #256 ZC - Zinc.
 - 2. Shelf Standards: Knape & Vogt, #255 Aluminum, screwed in place.
 - 3. Cabinet Pulls: Stanley wire pulls #4483 1/2, 3 1/2 inch center-to-center.
 - 4. Clip Locks: Amerock B-P36752.
 - 5. Hinges: Amerock #1238.
 - 6. Drawer Slides: Knape & Vogt # 1300.

- B. Cabinet Catches: Stanley magnetic #SP46(AI).

2.07 CUSTOM CASEWORK COMPONENTS

- A. Cabinet Construction Standards:
 - 1. Material Grades and Size Requirements: AWIC-S-1 Custom Grade.
 - 2. Face: HDPL.

3. Edge Treatment of Exposed and Semi-Exposed Components: AWI 400B-S-2 Custom Grade.
 4. Flush Cabinet Doors and Drawer Fronts: AWI 400B-S-3 Custom Grade.
 5. Drawer Sides and Backs: AWI 400B-S-4 Custom Grade.
 6. Drawer Bottoms: AWI 400B-S-5 Custom Grade
 7. Drawer Construction Techniques/Supports: AWI 400B-S-6 Custom Grade.
 8. Adjustable Shelf Techniques/Supports: AWI 400B-S-8 custom Grade.
 9. Joinery of Case Body Members: AWI 400B-S-9 Custom Grade.
 10. Fitting of Casework Doors, Drawers and Removable Panels: AWI 400B-T-1 Custom Grade.
 11. Flatness of Case Doors: AWI 400B-T-2 Custom Grade.
 12. Flushness between Factory Assembled Joints: AWI 400B-T-3 Custom Grade.
 13. Gap Tolerances: AWI 400B-T-4 Custom Grade.
 14. Edge/Joint Quality: AWI 400B-T-5 Custom Grade.
 15. Edge banding Performance: AWI 400B-T-6 Custom Grade.
- B. Doors and Drawer Fronts - 3/4 inch strawboard MDF.
1. Face: HDPL both sides.
 2. Core: Strawboard MDF.
 3. Thickness: 3/4 inch.
 4. Edge Treatment: 3/4 inch hardwood banding.
- C. Body Member (Ends, Divisions, Bottoms, Tops, and Rails):
1. Material: 3/4 inch strawboard MDF.
 2. Joinery and fastening of case body members: Bottoms and tops fastened to sides, ends and dividers by "stop dado method."
- D. Exposed Sides and Fronts:
1. Material: 3/4 inch strawboard MDF.
 2. Face: HDPL all sides.
- E. Shelves (exposed):
1. Material: 3/4 inch Strawboard MDF.
 2. Face: HDPL all sides.
 3. Edge Treatment: 1/4 inch hardwood banding.
- F. Backs:
1. Exposed material: 1/4 inch nominal thickness strawboard MDF.
 2. Face: HDPL.
 3. Concealed Material: 1/4 inch nominal thickness strawboard MDF.
- G. Quartz countertop:
1. Composition: Quartz aggregate, resin, and color pigment formed into flat slabs.
 2. Physical characteristics:
 - a. Water absorption: Maximum 0.04 percent, tested per ASTM C 97.
 - b. Bond strength: Average of 211 PSI (1.4 MPa), tested per ASTM C 482.
 - c. Modulus of rupture: Average of 6200 PSI (51.1 MPa), tested per ASTM C 99.
 - d. Flexural strength: 5620 PSI (50.3 MPa), tested per ASTM C 880.
 - e. Abrasion index: Minimum 62, tested per ASTM C 241.

- f. Thermal shock: Pass 5 cycles, tested per ASTM C 484.
 - g. Thermal expansion: 1.747×10^{-5} , tested per ASTM C 531.
 - h. Freeze thaw: Class MR3+, tested per ASTM 1026.
 - i. Deicing: Pass ASTM C 672.
 - j. Flame spread: Class 1 (FS-25 or less), tested per ASTM E84.
 - k. Mohs hardness: 6 to 6.5.
 - l. Stain resistance: Stains completely removed, tested per ASTM C 650, excluding hydroxide.
- 3. Thickness: 3/4 inch.
 - 4. Edge Treatment: Eased.
 - 5. Color: to be selected from full line of standard colors.
 - 6. Surface Finish: Polished.
 - 7. Provide from the following manufacturers:
 - a. Silestone by Cosentino USA, Inc.
 - b. CaesarStone USA
 - c. Or approved equal.
- H. Exposed Interiors for Cabinets:
- 1. Finish: HDPL.

2.08 FABRICATION

- A. Shop assembly casework for delivery to site in units easily handled and to permit passage through building openings. AWI Standards 400A-T Sections 1-5.
- B. Doors: 3/4 inch thick. AWI 400A-T-1. See elevations for doors to have locks.
- C. When necessary to cut and fit on site, provide materials with ample allowances for cutting. Provide trim for scribing and site cutting.
- D. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes, make corners and joints hairline. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cutouts. AWI 400C-G, 1-3.
- E. Provide cutouts for plumbing fixtures and other fixtures and fittings. Verify locations of cutouts from on-site dimensions. Seal contact surfaces of cut edges.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Section 01200 - Project Meetings: Verification of existing conditions before starting work.
- B. Verify adequacy of backing and support framing.
- C. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.02 INSTALLATION

- A. Set and secure materials and components in place, plumb, and level.
- B. Use purpose designed fixture attachments at concealed locations for wall mounted components.
- C. Use threaded steel concealed joint fasteners to align and secure adjoining cabinet units and countertops.
- D. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.
- E. Secure cabinet and counter bases to floor using appropriate angles and anchorages.
- F. Countersink anchorage devices at exposed locations used to wall mount components and conceal with solid plugs of species to match surrounding wood. Finish flush with surrounding surfaces.

3.03 ADJUSTING AND CLEANING

- A. Adjust doors, drawers, hardware, fixtures, and other moving or operating parts to function smoothly and correctly, as per Sections 01400 and 01770. Test installed work for rigidity and ability to support reasonable loads.
- B. Clean casework, counters, shelves, hardware, fittings, and fixtures.

3.04 SCHEDULE

- A. All Cabinets: Custom grade with quartz countertop.

END OF SECTION

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SECTION 06608

FIBERGLASS REINFORCED PLASTIC

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: General fabrication and design requirements for fiberglass reinforced plastic fabrications.

1.02 REFERENCES

- A. American Society of Mechanical Engineers (ASME):
 - 1. RTP-1 - Reinforced Thermoset Plastic Corrosion Resistant Equipment.
- B. ASTM International (ASTM):
 - 1. C582 - Standard Specification for Contact-Molded Reinforced Thermosetting Plastic (RTP) Laminates for Corrosion-Resistant Equipment.
 - 2. D883 - Standard Terminology Relating to Plastics.
 - 3. D2563 - Standard Practice for Classifying Visual Defects in Glass-Reinforced Plastic Laminate Parts.
 - 4. D2583 - Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor.
 - 5. D2584 - Standard Test Method for Ignition Loss of Cured Reinforced Resins.
 - 6. D3299 - Standard Specification for Filament-Wound Glass Fiber Reinforced Thermoset Resin Corrosion-Resistant Tanks.
 - 7. D4097 - Standard Specification for Contact-Molded Glass-Fiber-Reinforced Thermoset Resin Corrosion-Resistant Tanks.

1.03 DEFINITIONS

- A. The terminology of this specification is in accordance with ASTM D883. Fabricators using this specification are responsible for correct interpretation.
- B. Fiberglass reinforced plastic: Fiberglass Reinforced Plastic or glass fiber and resin fabrication consisting of approximately 35 to 55 percent glass fiber reinforcement by weight for hand lay-up structural laminates and 55 to 70 percent glass for filament wound structural laminates, unless otherwise specified.
- C. Equipment: The fiberglass reinforced plastic equipment, including ancillary equipment, work, and materials as described in this specification.
- D. Fabrication drawings: Those drawings produced by the Fabricator or Contractor, with the intention of providing the necessary information to construct or install the equipment.
- E. Mat: Fibrous material consisting of randomly oriented chopped or swirled filaments loosely held together with a binder.

- F. Chopped glass: Fibrous material consisting of randomly oriented chopped filaments applied directly to a mold surface or laminated under construction by a chopper gun.
- G. Fiber prominence (jackstraw): The distinct visibility of individual glass strands causing a loss of translucency of the laminate.

1.04 SUBMITTALS

- A. Shop drawings and calculations:
 - 1. Submit general arrangement and fabrication drawings, calculations, and elements of the design.
 - 2. Include submittal information which describes specifically how the equipment is to be built and details necessary to ascertain that products meet specified requirements. Provide in the form of drawings, standards, specifications, or other shop instructions, but may also be partially contained in quality control records. The submittal shall include, but not be limited to:
 - a. Fabrication drawings.
 - b. General arrangement drawings signed by an Engineer registered in the state where the project is located, showing complete structural, fasteners, and erection procedures for a complete assembly.
 - c. Quality control programs.
 - d. Verification that the manufacturer has been engaged in fabrication of similar fiberglass reinforced plastic equipment for a minimum of 5 years.
 - e. Statement of compliance with contract design requirements, codes, and standards.
 - f. Recommendation for each resin selection from resin manufacturer.
 - g. Type and amounts of fillers.
 - h. Nominal corrosion liner description.
 - i. Reinforcement types and glass content range for hand lay-up laminates.
 - j. For filament wound laminates:
 - 1) Helix angle.
 - 2) Glass content range.
 - 3) Strand yield.
 - 4) Strand per inch in the winding band.
 - 5) Ply thickness.
 - 6) Amount of chop or unidirectional roving interspersed with winding, if any, and location within laminate.
 - k. For other components:
 - 1) Construction type.
 - 2) Laminate thicknesses.
 - 3) Ply sequences.
 - 4) Glass content range.
 - l. For secondary overlays (both interior and exterior):
 - 1) Laminate thicknesses.
 - 2) Ply sequences and widths.
 - m. Construction details: Construction details for assembly and other special configurations, including:
 - 1) Tank bottom/top attachments with knuckle configuration and overlays and thicknesses.
 - 2) Tank support and anchor lugs, including attachment details.
 - 3) Tank nozzles and installation, including cutout reinforcement, gusseting, and similar items.

- 4) Tank lateral or other support fabrication details, including platform attachment clips and/or shoulders.
 - 5) Scrubber configuration and fabrication details of internal support system and other specialty items.
 - 6) Cover panel joints, anchorage detail, and details of doors and inspection ports and their attachment or incorporation within the cover.
- n. Miscellaneous equipment required.
 - o. Test reports and certification of compliance with physical property requirements.
 - p. Color samples.
 - q. Manufacturer's installation instructions.
 - r. ASME RTP-1 certification.

B. Operation and Maintenance Data.

C. Warranty.

1.05 QUALITY ASSURANCE

- A. Manufacturer qualifications: Fiberglass reinforced plastic manufacturer with experienced personnel, physical facilities, and management capacity sufficient to produce custom-made glass fiber and resin products of quality and size specified for minimum 5 years with satisfactory performance record.
- B. Quality assurance plan: Fabricator shall be responsible for implementation of a comprehensive quality assurance plan. The quality assurance plan describes procedures with the following minimum requirements:
 1. Fabricator shall designate personnel to inspect equipment while in process and after completion to ensure compliance to every aspect of the section and fabrication drawings.
 - a. Inspection shall include, as a minimum, checks for visual defects, laminate thickness and sequence, glass content, Barcol hardness, dimensional tolerances, adherence to construction details, surface preparation, and environmental conditions.
 - b. Fabricator's inspector shall complete a report of the findings including method of measurement for each separate assembly.
 2. Prior to use of resins in fabrication, fabricator shall extract samples of resins and retain them for use by the Engineer. Sample size shall be 100 cubic centimeters minimum:
 - a. Take 1 sample for each manufacturer's batch number if resin is received in the form it will be used.
 - b. If the fabricator alters the resin after receipt, such as through the addition of styrene, promoters, or other additives, take samples from each drum or portion thereof mixed with additives.
 - c. Fabricator shall provide documentation for each sample including resin type, manufacturer, batch and lot number, drum number, complete listing of additives with amounts added, and description and manufacturer of each additive.
 3. Fabricator shall inspect glass reinforcement prior to use in fabrication.
 - a. Do not use glass that does not meet the manufacturer's acceptance standards.

- b. Do not use glass material that is wet or has been wet.
- c. For each type of glass and lot number used, fabricator shall record the manufacturer, product description, binder type, product code, production date, and lot number.
- d. For mat, woven roving, unidirectional roving, and cloth, also include in records actual measured weight per square yard of material.
- 4. Fabricator shall retain nozzle cutouts and other excess laminate, clearly marking each piece to identify its original location. These laminate samples become the property of the Owner.
- 5. For areas where valid laminate samples are not available, take sample plugs at the Engineer's request.
 - a. Repair subsequent holes in a manner acceptable to the Engineer.
- 6. Fabricator shall verify glass content on available samples in accordance with ASTM D2584. Complete this test and submit the results complete for each major component where samples are available.
- 7. Prior to final shipment of the equipment, fabricator shall submit to the Engineer a complete quality control report, consisting of copies of records maintained for compliance with this Section.

PART 2 PRODUCTS

2.01 DESIGN AND PERFORMANCE CRITERIA

- A. Design fiberglass reinforced plastic tanks, scrubbers, and other vessels following the procedures and methods, utilizing the equations and formulas, and incorporating safety factors and allowable design stresses and strains set forth in ASME RTP-1. Base the design of duct and other fiberglass reinforced plastic equipment not covered by ASME RTP-1 on the engineering rationale, applicable formulas, and safety factors set forth in ASME RTP-1.
- B. Perform calculations necessary to ensure long-term, low risk service of the fiberglass reinforced plastic equipment with minimum reasonable maintenance requirements.
 - 1. Long-term, low risk service is defined as a service life of 20 years without major structural failure or leakage.
 - 2. The design shall ensure proper functioning of the equipment at the stated operating conditions.
 - 3. The design shall include as a minimum, engineering calculations, materials selection and documented physical and mechanical properties, and detailed drawings required for fabrication and assembly of the equipment.
- C. Design in accordance with applicable national, regional, and local design and building codes.
 - 1. Wind and seismic forces shall be determined in accordance with the building code as specified in Section 01410 - Regulatory Requirements.
- D. Resistance to overturning shall not include the weight of the liquid contained in the equipment.
- E. Consider the interaction of the installed system including but not limited to thermal expansion of duct, tanks, and vessels and the effects of external loading from piping, fans, pumps, platforms, and other attached items.

- F. Allow for the most severe combination of conditions which may include, but not be limited to, the following:
1. Internal or external pressure.
 2. Static head of contents (working and test conditions).
 3. Mass of structure and contents.
 4. Design temperature including upset conditions.
 5. Superimposed loads, such as seismic and wind forces.
 6. Bending moments due to eccentric loads.
 7. Localized loads acting at supports, lugs, and other attachments.
 8. Shock loads.
 9. Loads due to heating or cooling and thermal gradients.
 10. Loads applied during transport or erection.
 11. Loads imposed by personnel during erection and operations.
 12. Fatigue.
- G. Use safety factors and allowable strains specified in ASME RTP-1 unless otherwise specified. Do not use safety factors and allowable strains less than the following:
1. Allowable hoop and axial strain shall be 0.001 inch per inch for filament wound tanks.
 2. A safety factor of 10 for hand lay-up components in tension, flexure, or other loading conditions where elastic stability is not in question.
 3. A safety factor of 5 for external loading (vacuum) or local buckling due to seismic or wind loading.
- H. Safety factors for upset conditions or infrequent loading situations may be less than the above values for the specific condition if acceptable to the Engineer.
- I. There will typically be other aspects which should be considered. Identify and consider their effects, identify design limitations, and submit this information.
- J. Provide test reports or other documentation for laminate properties used in the design. Laminates shall be similar in construction, layer sequence, resin type, and cure to those used to determine tested properties. Properties shall be adjusted to reflect reductions at operating temperatures. Test reports shall be provided for:
1. Grating: Indicate grating strength and deflection.
 2. Physical properties of test cover panels.
 3. Tanks showing conformance with specified strength requirements.
- K. The corrosion liner shall be a minimum of 100 mils in thickness, unless otherwise specified, and documentation shall be provided verifying veil type, liner thickness, and resin cure.
1. Consider 50 mils of the corrosion liner as sacrificial and do not include it in determining structural wall thickness.
 2. Use structural wall thickness not less than 0.375 inches for tanks and vessels and 0.1875 inches for ductwork.
 3. Submit minimum structural thicknesses of other types of fiberglass reinforced plastic fabrications.

- L. Laminate types may include hand layup, helical winding, and hoop/chop construction methods.
 - 1. In laminates with helix angles greater than 80 degrees and in hoop/chop laminates, orientate approximately 10 percent of the structural wall thickness at 0 degrees (longitudinal direction).
 - 2. Apply this reinforcement in at least 2 layers of weft unidirectional fabric and equally spaced within the structural wall.
- M. For tanks and scrubbers; nozzles, determine manways and shell reinforcements according to the tables and formulas in ASME RTP-1.
- N. Anchor tanks and vessels using lugs and a continuous filament wound band or an integral filament wound load ledge with external stainless steel anchor clips.
 - 1. The anchor clips shall be bolted to the concrete foundation; use non-shrink grout to level anchor clips.
 - 2. The design shall resolve the sum of the moments and the sum of the force equal to 0.
- O. Design internal beams and support attachments using a maximum of 200 pounds per square inch shear stress for secondary bonds. Also apply this to design of external lugs required for ladders, platforms, and other attached items.

2.02 RESIN AND REINFORCEMENT MATERIALS

- A. General physical properties: In accordance with ASTM C582, ASTM D3299, ASTM D4097, and ASME RTP-1 with verification of properties. Physical properties may include tensile, flexural, and compression modulus of elasticity and ultimate strengths, limiting strains, Poisson ratios, coefficients of expansion, and other directional properties as required for the design of the equipment.
- B. Resin:
 - 1. Fabricate equipment using the corrosion-resistant resin(s) specified in the fiberglass reinforced plastic equipment specifications. The fabricator is required to obtain independent endorsement of each resin selection from the resin manufacturer. Unless otherwise specified, use the resin throughout laminates.
 - 2. The type of catalyst recommended varies between resin manufacturers. Submit resin/catalyst before fabrication begins to verify compliance to the resin manufacturer's recommended procedures.
 - 3. Employ no fillers, additives, or pigments in the resin.
 - a. A thixotropic agent for viscosity control may be used in the proportion and type recommended by the resin manufacturer.
 - b. Use no thixotropic agent in the corrosion liner or on surfaces to be in contact with the corrosive environment.
 - 4. Make resin putty using the same resin as was used in the original fabrication and shall contain milled glass fibers.
 - a. The use of silica flour, grinding dust, or other fillers is not allowed.
 - 5. When specified, add antimony trioxide or antimony pentoxide to the resin in the amount necessary to achieve the required fire retardancy rating in the structural wall only. Follow resin manufacturer's recommendations.
 - a. Unless otherwise specified, the corrosion liner shall not contain this additive.

- C. Reinforcement:
1. Show the type and sequence of reinforcements to be used on the fabrication drawings.
 2. Use as commercial grade corrosion-resistant borosilicate glass fiber reinforcement, unless otherwise specified.
 3. Use glass fiber reinforcing having a surface finish and binder that is specifically recommended by the glass manufacturer for the particular resin system to be used.
 4. Use Type C (chemical grade) glass, 10 mils (0.01 inches) thickness, or polyester surfacing veil, such as Nexus surfacing veils.
 5. Use Type E (electrical grade) glass, 1-1/2 ounces or 3/4-ounce per square foot, with nominal fiber length of 1.25, within 0.75 inches mat.
 6. Continuous glass roving used in chopper guns for spray up shall be Type E chopper roving.
 7. Woven roving shall be 24 ounces per square yard Type E glass and have a 5-by-4 plain weave.
 8. Continuous roving used in filament wound structures shall be Type E glass winder roving with a yield of 200 yards or more per pound.
 9. Use Type E glass unidirectional fabric. Weft unidirectional fabric shall be 15.7 ounces per square yard.
 10. When specified, use Type ECR glass reinforcements supplied in similar fabric styles to those specified above.

2.03 FABRICATION

- A. Molds:
1. Construct molds of a suitable material to produce a smooth and glossy corrosion liner surface on the fiberglass reinforced plastic equipment.
 2. Covering of mandrels with cardboard must be accepted by the Engineer prior to start of fabrication.
- B. Laminates:
1. Determine specified glass content in accordance with ASTM D2584.
 2. Consider laminate thicknesses shown on the fabrication drawings as construction minimums. Verify that minimum thicknesses are obtained using the laminate sequences specified. When only total laminate thicknesses are specified or indicated on the Drawings, the minimum allowable structural laminate thickness shall be the total laminate thickness less the specified corrosion liner thickness.
 3. Interruptions in laminating sequence shall follow the application of a ply of mat and be succeeded by a ply of mat.
 4. The interruption shall not exceed 24 hours, and the in-process surface must retain acetone sensitivity until laminating is resumed. Lack of compliance with these aspects or indication that contamination of the surface has occurred shall require that surface preparation be accomplished before resuming.
 5. Chopped strand glass applied by chopper gun is allowed in lieu of mat layers in the structural laminates only.
 - a. Chopper gun application of the corrosion liner is not allowed.
 6. Coat non-mold surfaces with resin containing wax additive in the amount necessary to allow full cure of the surface. In the case of exterior surfaces, this wax coat shall also contain an ultraviolet stabilizer in the type and amount recommended by the resin manufacturer.

7. The exterior surface of equipment shall be resin-rich and reinforced with 1 layer C glass surfacing veil, unless otherwise specified.
 8. When specified, the exterior coat shall be an opaque pigmented surface coat, applied only after Engineer's inspection. Color shall be selected by the Engineer.
- C. Corrosion liner laminates:
1. The inner surface of laminates shall be resin-rich and reinforced with surfacing veil of the type and number of layers as shown on the fabrication drawings.
 2. The interior layer of the corrosion liner shall consist of 1-1/2 ounces per square foot mat in the number of layers specified on the fabrication drawings. An exotherm interruption is specifically prohibited within the corrosion liner.
 3. Chopped glass applied by chopper gun is not allowed in the corrosion liner.
 4. Plies of the inner surface and interior layer are to gel completely before proceeding with the structural laminates.
 5. Completed corrosion liner as described above shall contain not less than 20 percent nor more than 30 percent glass by weight.
 - a. Use no thixotropic material in the resin for the liner, nor in the fabrication of fiberglass reinforced plastic components intended for internal service.
 - b. The completed liner shall be the minimum thickness specified or indicated on the Drawings.
 6. Do not use a separately cured unreinforced gel coat.
- D. Hand lay-up structural laminates:
1. The corrosion liner laminate shall be followed by hand lay-up structural laminates of varying reinforcement sequences as indicated on the fabrication drawings.
 2. For hand lay-up structural laminates, reinforcement shall consist of mat and woven roving in the sequence specified on the fabrication drawings.
 3. Woven roving shall have a ply of mat on each side. Two adjacent plies of woven roving are not permitted.
 4. Laminates containing primarily 1-1/2 ounces per square foot mat layers in conjunction with woven roving shall contain not less than 35 percent or more than 45 percent glass (by weight).
 5. Laminates containing primarily 3/4-ounce per square foot mat layers in conjunction with woven roving are considered to be high strength laminates and shall contain not less than 45 percent or more than 55 percent glass by weight.
- E. Filament wound structural laminates:
1. The corrosion liner laminate shall be followed by filament wound structural laminates as indicated on the fabrication drawings.
 2. For filament wound structural laminates, reinforcement shall consist of continuous strand fiberglass roving applied with a minimum of interruptions until the specified minimum thickness is attained.
 - a. This laminate shall contain 55 to 70 percent glass by weight as indicated on the fabrication drawings.
 3. Each complete cycle of filament winding shall form a closed pattern of winding bands which completely covers the surface with 2 bi-directional layers.
 - a. Each layer shall be a maximum of 1 roving in thickness.
 - b. Uniformly space the filaments across the winding band without bunching or gapping.

4. Specify the helix angle of winding on the approved fabrication drawings, as measured from the centerline of revolution of the equipment shell.
5. Tolerance on helix angle is plus or minus 2 degrees, unless otherwise specified.
6. The fabrication drawings may require that layers of unidirectional roving be interspersed within the continuous filament winding.
7. Apply the unidirectional roving with the glass strand aligned in the axial direction, to within plus or minus 5 degrees.
8. If layers of mat or chopped glass are needed to ensure proper bonding of unidirectional roving, or within the filament winding to accommodate the Fabricator's manufacturing methods, consider the layers' extra material that will result in a thickness greater than specified. The amount of filament winding and unidirectional roving specified must still be applied.

F. Joining laminates:

1. Fiberglass reinforced plastic joining laminates are subject to applicable requirements specified in other sections for laminates.
2. Reinforce fiberglass reinforced plastic joints with an overlay of glass reinforcement and resin which extends equally within plus or minus 1/2 inch on each side of the joint. Use minimum thickness, ply sequence, and ply widths of fiberglass reinforced plastic joints as indicated on fabrication drawings.
3. Restrain parts to be joined to prevent movement until completion and cure of the joint overlay.
4. Fit-up parts and verify that tolerances and assembly requirements are satisfied. Completely fill the void between component parts with resin putty, taking care not to extrude an excessive amount of putty into the interior.

G. Environment:

1. The fabrication process and materials at the point of fabrication are to be maintained within a range of 60 to 95 degrees Fahrenheit. This temperature must also be at least 5 degrees greater than wet bulb temperature, as measured with a sling psychrometer.
2. Store materials in a dry area and within the temperature and humidity limits recommended by the manufacturers.

H. Flanges:

1. Make flanges by hand lay-up construction with nozzle neck and flange made integrally in 1 piece and fabricated in accordance with the dimensions indicated on the fabrication drawings. Extend layers of reinforcement in the nozzle neck and hub uninterrupted into the flange.
2. Build-up additional hub thickness using alternating layers of 1-1/2 ounces per square foot mat and 24 ounces per square yard woven roving.
3. Build-up additional thickness in the flange using "ring" cutouts of mat, evenly distributed throughout the flange thickness.
4. Press molded or filament wound flanges are not allowed.
5. Overall machine facing of the back of flanges is not permitted.
 - a. To obtain proper seating, spotface bolt holes for SAE size washers.
 - b. Resin coat bolt holes and other cut surfaces so that no fibers are exposed.
 - c. Spotfacing shall not produce a flange thickness less than indicated in the fabrication drawings.

6. Bolt holes in flanges shall straddle principal centerlines of the Equipment. Tolerance in bolt hole locations and in diameter of bolt circle shall be plus 1/16 inch.
 7. Depressions or projections in flange face shall be no greater than 1/32 inch.
- I. Allowable visual defects:
1. Visual defects in areas of the equipment shall not exceed the maximum allowable levels of visual defects set forth in Table A, unless acceptable to Engineer.
 2. Visual defects in accordance with ASTM D2563.
 3. Presence of visual defects in excess of the allowable levels of Table A shall be grounds for rejection of the equipment. Listed quantities apply to small, localized areas and shall not be averaged over larger areas.
 4. For the purpose of Table A, use of the following definitions apply:
 - a. INNER surface - Interior process surface, thickness of surfacing veil(s), and interface between veils and mat layers. Includes surfacing veils on internal joints.
 - b. Interior mat layers - Layers of mat following the inner surface, and interface between liner and structural wall. Includes mat layers on internal joints.
 - c. Structural wall - Layers of filament winding or alternating layers of mat and woven roving following the corrosion liner, and layers of mat and woven roving in internal overlays.
 - d. Exterior surface - The exterior surface of the laminate and the thickness of the surfacing veil.
 - e. Dimensions listed in Table A refer to the largest dimension measured for defects.

TABLE A				
MAXIMUM ALLOWABLE LEVELS OF VISUAL DEFECTS				
Condition/ Defect	Inner Surface	Interior Mat Layers	Structural Wall	Exterior Surface
Chip	None	None	None	
Crack	None	None	None	
Crazing	None	None	None	
Delamination	None	None	See Air Bubble	
Dry Spot	None	See Air Bubble	See Air Bubble	
Foreign Inclusion	None	Maximum Diameter 1/32"	See Air Bubble	
Fracture	None	None	None	None
Air Bubble/ Void	Less than 1/64" Ø unlimited. 1/64" to 1/16" Ø 2 / sq. in. Maximum Diameter 1/16"	Less than 1/32" Ø unlimited. 1/32" to 1/8" Ø 5 / sq. in. Maximum Diameter 1/8"	Less than 3/16" Ø unlimited. 3/16" to 1/4" Ø 2 / sq. in. Maximum Diameter 1/4"	
Blister	See Air Bubble	See Air Bubble	See Air Bubble	

TABLE A MAXIMUM ALLOWABLE LEVELS OF VISUAL DEFECTS				
Condition/ Defect	Inner Surface	Interior Mat Layers	Structural Wall	Exterior Surface
Burned	None	None	None	
Pit (Pinhole)	Less than 1/32" Ø 50/square feet 1/32" to 1/16" Ø 10/square feet Maximum Diameter 1/16" Maximum Depth 1/32"	N/A	N/A	
Resin Pocket	None	Maximum 1 square inch per occurrence.	Maximum 1 square inch per occurrence.	
Wrinkle	Allowable if laminate is glass reinforced. No sharp edges allowed.	Allowable if laminate is glass reinforced and full mat layer thickness and total thick- ness are maintained.	Allowable if laminate is glass reinforced and full mat layer thickness and total thick- ness are maintained.	
Scratch	None	N/A	N/A	
Fiber Prominence	None	Maximum 10 fibers visible per square inch	Maximum 20 fibers visible per square inch	

2.04 SOURCE QUALITY CONTROL

A. Inspection:

1. Owner's inspection: Permit the Engineer access to the equipment during fabrication and upon completion for the purpose of verifying compliance to the Contract Documents. The inspection is not intended to replace the Fabricator's own quality control procedures.
2. In no respect does inspection of equipment by Engineer relieve the Fabricator of compliance with the Contract Documents.
 - a. A final inspection will be performed by the Engineer.
3. The Fabricator shall notify the Engineer at the completion of particular milestones during fabrication. The milestones are as follows:
 - a. View tooling prior to fabrication.
 - b. Beginning application of corrosion liner for each part, extraction of each part prior to beginning assembly.
 - c. Upon completion of each separate assembly, Engineer reserves the right to include additional milestones.
4. Allow Engineer to photograph the equipment while in process and/or upon completion.
5. Engineer may use magnification or other special viewing or measurement devices during inspection.
6. Evidence of poor workmanship or lack of compliance with aspects of the Contract Documents will be grounds for rejection of the equipment.

7. Subsequent repair of rejected equipment may, at the Engineer's option, be undertaken in an attempt to bring the equipment to an acceptable state.
 - a. Repair procedures must be accepted by the Engineer prior to implementation.

2.05 TESTING

- A. The Engineer may employ destructive testing, such as ultimate tensile or flexure strength tests or glass content ignition tests, on available samples or use other non-destructive test methods, such as acoustic emission or ultrasonic polygauge thickness measurement, on the completed equipment for verification of compliance to the contract documents.
- B. Testing performed by the Engineer will be accomplished through use of applicable ASTM test methods when appropriate.
- C. Hardness tests will be made for acceptance by the Engineer on the liner surface using the Barcol impressor, Model GYZJ 934 1, calibrated at 2 points in accordance with ASTM D2583.
 1. Ten readings will be taken in a localized area, deleting the 2 highest and 2 lowest, and averaging the remaining 6.
 2. Minimum acceptable Barcol hardness will be a reading of 30 unless otherwise specified.
- D. An acetone sensitivity test will also be performed by the Engineer as an acceptance criteria. Evidence of a sticky or tacky surface following rubbing with an acetone-saturated cloth will be grounds for rejection of the equipment.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 07110

DAMPPROOFING

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Cold applied asphalt bitumen dampproofing of CMU and concrete wall surfaces in wall cavity assemblies.

1.02 REFERENCES

- A. The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by basic designation only.
- B. ASTM International:
 - 1. D449 – Asphalt Used in Dampproofing and Waterproofing.
 - 2. D491 – Asphalt Mastic Used in Waterproofing.
- C. NRCA (National Roofing Contractors Association) – Waterproofing Manual.

1.03 SUBMITTALS

- A. Submit under provisions of Section 01300 – Submittals: Requirements for submittals.
- B. Product Data: Provide properties of primer, bitumen, and mastics.
- C. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.04 QUALITY ASSURANCE

- A. Perform Work in accordance with NRCA Waterproofing Manual.
- B. Maintain one copy of each document on site.

1.05 PROJECT CONDITIONS

- A. Maintain ambient temperatures above 40 degrees Fahrenheit for 24 hours before and during application until membrane has cured.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Sonneborn Hydrocide 700B.

- B. Gulf Seal.
- C. Substitutions: Section 01600 - Product Requirements.

2.02 MATERIALS

- A. Cold asphalt mastic: ASTM 1227-87, Type IV and Federal Specification Specifications Sections-R-1781, Type 1.
- B. Accessories
 - 1. Fiberglass mesh tape.

PART 3 EXECUTION

3.01 GENERAL

- A. Verify substrate surfaces are durable, free of matter detrimental to adhesion or application of dampproofing system.
- B. Verify items which penetrate surfaces to receive dampproofing are securely installed.

3.02 PREPARATION

- A. Protect adjacent surfaces not designated to receive dampproofing.
- B. Clean and prepare surfaces to receive dampproofing in accordance with manufacturer's instructions.
- C. Do not apply dampproofing to surfaces unacceptable to manufacturer or applicator.
- D. Apply mastic to seal penetrations, small cracks, or minor honeycomb in substrate.

3.03 APPLICATION

- A. Prime surfaces in accordance with manufacturer's instructions.
- B. Apply cold bitumen by trowel.
- C. Apply bitumen at a temperature limited by equiviscous temperature (EVT) plus or minus 25 degrees Fahrenheit (14 degrees Centigrade); finish blowing temperature not to be exceeded for four hours.
- D. Apply bitumen in one coat, continuous and uniform, at a rate of 4 gal/100 square feet.
- E. Seal items projecting through dampproofing surface with mastic. Seal watertight.

3.04 SCHEDULE

- A. All CMU and concrete cavity surfaces on exterior walls.

3.05 MEASUREMENT AND PAYMENT

- A. Unless otherwise indicated, no separate measurement or payment for work performed under this Section. Include cost of same in Contract price bid for work of which this is a component part.

END OF SECTION

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SECTION 07131

SHEET MOISTURE BARRIER

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Sheet membrane vapor permeable weather resistive barrier.

1.02 REFERENCES

- 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:
 - 1. ASTM D 570 - Test Method for Water Absorption of Plastics.
 - 2. ASTM D 1004 - Test Method for Initial Tear Resistance of Plastic Film and Sheeting.
 - 3. ASTM E 96 - Test Methods for Water Vapor Transmission of Materials.
 - 4. ASTM E 331-86 - Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure.
 - 5. ASTM D 828-93- Tensile Properties of Paper and Paperboard Using Constant-Rate-of-Elongation Apparatus.
 - 6. ASTM 96-95- Water Vapor transmission of Materials.
 - 7. ASTM F 1249-90 – Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor.

1.03 DESIGN AND PERFORMANCE CRITERIA

- A. System Description:
 - 1. Waterproofing System: Vapor permeable, weather resistive barrier which prevents moisture migration to interior.

1.04 SUBMITTALS

- A. Section 01300 - Submittals: Submittal procedures.
- B. Product Data: Submit data for surface conditioner, flexible flashings, joint cover sheet, and joint and crack sealants, with temperature range for application of waterproofing membrane.
- C. Manufacturer's Installation Instructions: Submit special procedures and perimeter conditions requiring special attention.
- D. Warranty: Submit manufacturer warranty and ensure forms have been completed in OWNER's name and registered with manufacturer.

1.05 SUSTAINABLE DESIGN SUBMITTALS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
 - 1. Materials Resources Certificates:
 - a. Certify recycled material content for recycled content products.

1.06 QUALITY ASSURANCE

- A. Perform Work in accordance with NRCA Waterproofing Manual.
- B. Maintain one copy of each document on site.

1.07 PROJECT CONDITIONS

- A. Qualifications:
 - 1. Membrane Manufacturer: Company specializing in waterproofing sheet membranes with minimum three years documented experience.
 - 2. Applicator: Company specializing in performing the work of this section.
- B. Mock-Up:
 - 1. Construct Mock-up of 100 square feet waterproofed panel; to represent finished work including internal and external corners, seam jointing, attachment method, Counterflashing cover, base flashings, control and expansion joints.
 - 2. Mock-up may remain as part of the Work.
- C. Pre-Installation Meeting:
 - 1. Section 01400 – Quality Control Services: Pre-installation meeting.
 - 2. Convene minimum one week prior to commencing work of this section.
- D. Environmental Requirements:
 - 1. Maintain ambient temperatures above 40 degrees Fahrenheit for 24 hours before and during application and until liquid or mastic accessories have cured.

1.08 WARRANTY

- A. Section 01700 - Contract Closeout: Product warranties and product bonds.
- B. Provide five-year manufacturer warranty for waterproofing failing to resist penetration of water.

PART 2 PRODUCTS

2.01 WEATHER RESISTIVE BARRIER

- A. Manufacturers:
 - 1. Dupont Corporation, Tyvek Commercial wrap and seal/flashing system.
 - 2. Or approved equal.

2.02 MOISTURE BARRIER

- A. Moisture Barrier: Class C, Flash spun bonded, high density polyethylene fiber non woven membrane, 5 to 7 mm thick.

2.03 SUSTAINABILITY CHARACTERISTICS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design compliance.
- B. Materials and Resources Characteristics:
 - 1. Recycled Content Materials: Furnish materials with maximum available recycled content.

2.04 COMPONENTS

- A. Membrane: Tyvek Commercial Wrap.
- B. Transition Flashing: Tyvek Flex wrap and straight flash.
- C. Self Adhesive Tape: Tyvek, to meet the needs of the wrap and flash system.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Section 01200 – Project Meetings: Coordination and project conditions.
- B. Verify substrate surfaces are durable; free of matter detrimental to adhesion or application of waterproofing system.
- C. Verify items which penetrate surfaces to receive waterproofing are securely installed.
- D. Verify substrate surface slopes to drain for horizontal waterproofing applications.

3.02 PREPARATION

- A. Protect adjacent surfaces not designated to receive waterproofing.
- B. Clean and prepare surfaces to receive waterproofing.
- C. Do not apply weather barrier to surfaces unacceptable to manufacturer.

- D. Seal cracks and joints with sealant materials using depth to width ratio in accordance with Section 07900 – Joint Sealers.

3.03 INSTALLATION - MECHANICALLY ATTACHED WEATHER BARRIER

- A. Roll out membrane. Minimize wrinkles.
- B. Install mechanical fasteners in accordance with manufacturer's seven step installation process instructions.
- C. Overlap edges and ends.
- D. Weather lap joints on sloped substrate in direction of drainage.
- E. Seal items protruding to or penetrating through membrane and install Counterflashing membrane material.
- F. Installation: Self Sealant Flashing Around Windows.
 - 1. Flashing is first applied at the sill and then jambs of window openings.
 - 2. Overlap edges minimum of 3 inches on each side.

3.04 PROTECTION OF INSTALLED CONSTRUCTION

- A. Section 01700 - Contract Closeout: Protecting installed construction.
- B. Do not leave installed membrane exposed for longer than 90 days. Replace with new any layers exposed after 90 days.

3.05 SCHEDULE

- A. Exterior Surface Over all Sheathing: One ply of membrane weather barrier over sheathing; tape over membrane joints.
- B. Self-Adhesive Flashing: Around windows and penetrations.
 - 1. Straight flash on vertical transitions to windows doors and storefronts.
 - 2. Flex wrap on horizontal transition applications and noted conditions.

END OF SECTION

SECTION 07160

SHEET VAPOR RETARDERS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Vapor barrier, seam tape, mastic, and pipe boots for installation under concrete slabs.
- B. As specified in Section 410S – Concrete Structures and Section 02360 – Termite Control.

1.02 REFERENCE STANDARDS

- 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. American Society for Testing and Materials (ASTM):
 - 1. E 1745 - Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slab.
 - 2. E 154-99 (2005) Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs
 - 3. E 96-05 Standard Test Methods for Water Vapor Transmission of Materials
 - 4. F 1249-06 Standard Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor
 - 5. E 1643-09 Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs
- C. American Concrete Institute (ACI)
 - 1. ACI 302.1R-04 Vapor barrier component (plastic membrane) is not less than 10 mils thick.

1.03 SYSTEM DESCRIPTION

- A. Vapor Barrier (Under Slab): Shall conform to ASTM E1745, Class A and shall have a maximum water vapor permeance of 0.0095 perms when tested in accordance with ASTM E96. Vapor Barrier shall be no less than 15 mils thick.

1.04 SUBMITTALS

- A. Furnish the following in accordance with Specification Section 01300 - Submittals and Section 01730 - Operation and Maintenance Manuals:
 - 1. Product Data: Submit data on vapor barrier, seam tape and mastic.
 - 2. Manufacturer's Instructions: Manufacturer's installation instructions.

1.05 QUALITY ASSURANCE

- A. Provide Manufacturer's Samples, literature.
- B. Provide Manufacturer's installation instructions for placement, seaming and pipe boot installation

PART 2 PRODUCTS

2.01 MANUFACTURERS AND MATERIALS

- A. One of the following or equal:
 - 1. Stego Industries LLC., 887-464-7834.
 - a. Stego Wrap – 15 mil.
 - 2. Raven Industries, 605-336-2750.
 - a. VaporBlock -15 mil.
 - 3. WR Meadows. 800-342-5976.
 - a. Perminator – 15 mil.
 - 4. Epro Waterproofing Systems, 800-882-1896.
 - a. Ecoshield-E15 mil.

2.02 ACCESSORIES

- A. Seam tape: as recommended by manufacturer.
- B. Mastic: as recommended by manufacturer.
- C. Pipe Boots: as recommended by manufacturer.

PART 3 EXECUTION

3.01 PREPARATION

- A. Verify that substrate conditions are acceptable for product installation in accordance with manufacturer's instructions.
- B. Remove all sharp and protruding objects from surfaces to receive vapor barrier.
- C. Ensure that subsoil is approved by Structural Engineer or Geotechnical Engineer.
 - 1. Level and tamp or roll aggregate, sand or granular base.

3.02 INSTALLATION

- A. Install vapor barrier in accordance with manufacturer's instructions and ASTM E1643.
- B. Lay sheet smoothly, stretch and weight edges, lap joints 12 inches and seal with tape as specified by vapor barrier manufacturer. Turn barrier up 6 inches at walls and at all pipes, abutments, etc. Tape and seal at penetrations and edges per manufacturer's instruction.

- C. No penetration of the vapor barrier is allowed except for reinforcing steel and permanent utilities
- D. At grade beams, extend vapor barrier down sides of beam trenches and footing excavations to within 4 inches of trench bottom and secure to sides of trench. Do not extend barrier across bottom of beam.

3.03 PATCHING

- A. Patch and repair all punctures with a minimum overlap of 6 inches in all directions and tape around entire perimeter of repair.

3.04 PROTECTION

- A. Protect vapor barrier so that other construction activities do not puncture, damage, or otherwise cause deterioration of vapor barrier.

3.05 SCHEDULE

- A. Below Slab at the Substation #1 (85).
- B. Below Slab at the Administration Building (90).

END OF SECTION

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SECTION 07210

PRE-ENGINEERED BUILDING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES:

- A. Pre-Engineered Building Insulation for New Construction.

1.02 REFERENCES

- A. The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by basic designation only.
- B. ASTM International:
 - 1. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
 - 2. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 3. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials.
 - 4. ASTM C 1136 – Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.
- C. National Fire Protection Association:
 - 1. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.
- D. Underwriters Laboratories Inc.:
 - 1. UL 723 - Tests for Surface Burning Characteristics of Building Materials.

1.03 DESIGN REQUIREMENTS

- A. Thermal resistance of installed system at exterior walls: R-Value of 13, minimum.
- B. Thermal resistance of installed system at roof: R-Value of 29, minimum.
- C. Insulating system shall have a continuous vapor barrier inside of building purlins, girts, and insulation to provide complete isolation from inside conditioned air.

1.04 SUBMITTALS

- A. Furnish the following in accordance with Specification Section 01300 - Submittals.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation instructions.

- C. Shop Drawings: Indicate locations of connections and attachments, general details, anchorages and method of anchorage and installation.
- D. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square or long, representing actual products required for this project.
- E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.05 SUSTAINABLE DESIGN SUBMITTALS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
 - 1. Materials Resources Certificates:
 - a. Certify recycled material content for recycled content products.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing product systems specified in this section with minimum five years documented experience.
- B. Installer Qualifications: Company specializing in performing work of this section.
- C. Insulation system components to include a ten-year limited material warranty.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store products indoors and protect from moisture, construction traffic, and damage.

1.08 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Batt Insulation: the following or approved equal:
 - 1. Acceptable Manufacturer: Thermal Design, Inc., Simple Saver System. P.O. Box 468, 601 N. Main Street, Madison, NE 68748. ASD. Tel: (800) 255-0776 or (402) 454-6591. Fax: (402) 454-2708. Email: sales@thermaldesign.com, www.thermaldesign.com.

2.02 SUSTAINABILITY CHARACTERISTICS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design compliance.
- B. Materials and Resources Characteristics:
 - 1. Recycled Content Materials: Furnish materials with maximum available recycled content.

2.03 MATERIALS

- A. Simple Saver System consists of Batt Insulation, Roof Insulation, Wall Insulation, Vapor Barrier Liner Fabric, Thermal Breaks, Straps, and other devices and components in a proprietary insulation system as follows:
 - 1. Thermal Resistance: refer to 1.04.
 - 2. Batt Size: Equal to purlin/girt spacing by manufacturer's standard lengths.
 - 3. Unfaced.
- B. Roof Insulation: Formaldehyde-free fiberglass batt or fiberglass blanket complying with ASTM C 991 Type 1 and ASTM E 84 with a thermal resistance and thickness as follows:
 - 1. As indicated on the drawings.
 - 2. R-29; 9 inches (229 mm), 6 inches (152 mm) plus 3 inches (76 mm) (two layers).
- C. Wall Insulation: Formaldehyde-free fiberglass blanket or batt complying with ASTM C 991 Type 1, ASTM E 136 and ASTM E 84 with a thermal resistance and thickness as follows:
 - 1. As indicated on the drawings.
 - 2. R-26; 8 inches (204 mm).
- D. Vapor Barrier Liner Fabric: Syseal® type woven, reinforced, high-density polyethylene yarns coated on both sides with a continuous white or colored polyethylene coatings, as follows:
 - 1. Product complies with ASTM C 1136, Types I through Type VI.
 - 2. Perm rating: 0.02 for fabric and for seams in accordance with ASTM E 96.
 - 3. Flame/Smoke Properties:
 - a. 25/50 in accordance with ASTM E 84.
 - b. Self-extinguishes with field test using matches or butane lighter.
 - 4. Ultra violet radiation inhibitor to minimum UVMAX® rating of 8.
 - 5. Size and seaming: Manufactured in large custom pieces by extrusion welding from roll goods, and fabricated to substantially fit defined building area with minimum practicable job site sealing.
 - 6. Provide with factory double, extrusion welded seams. Stapled seams or heat-melted seams are not acceptable due to degradation of fabric.
 - 7. Factory-folded to allow for rapid installation.
 - 8. Color: As selected by Architect.
- E. Vapor Barrier Lap Sealant: Solvent-based, Simple Saver polyethylene fabric adhesive.
- F. Vapor Barrier Tape: Double-sided sealant tape 3/4 inch (19 mm) wide by 1/32 inch (.79 mm) thick.

- G. Vapor Barrier Patch Tape: Single-sided, adhesive backed sealant tape 3 inches (76 mm) wide made from same material as Syseal® type liner fabric.
- H. Thermal Breaks:
 - 1. 1/8 inch (3 mm) thick by 3 inch (76 mm) wide white, closed-cell polyethylene foam with pre-applied adhesive film and peel-off backing.
 - 2. Polystyrene Snap-R snap-on thermal blocks.
- I. Straps:
 - 1. 100 KSI minimum yield tempered, high-tensile-strength steel.
 - 2. Size: Not less than 0.020 inch (0.50 mm) thick by 1 inch (25 mm) by continuous length.
 - 3. Galvanized, primed, and painted to match specified finish color on the exposed side.
 - a. Color: As selected by Architect.
 - 4. Primed and painted to match specified finish color on the exposed side .
 - a. Color: As selected by Architect.
 - 5. High-tensile-strength stainless steel.
 - 6. Woven polyester plastic. Color as selected.
- J. Fasteners:
 - 1. For light gage steel: #12 by 3/4 (19 mm) inch plated Tek 2 type screws with sealing washer, painted to match specified color.
 - 2. For heavy gage steel: #12 by 1-1/2 inch (38 mm) plated Tek 4 type screws with sealing washer, painted to match specified color.
 - 3. For wood, concrete, other materials: As recommended by manufacturer.
- K. Wall Insulation Hangers: Fast-R preformed rigid hangers, 32 inch (813 mm) long galvanized steel strips with barbed arrows every 8 inches (203 mm) along its length.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that building structure including all bracing and any concealed building systems are completed and approved prior to installing liner system and insulation in the structure.
- B. Correct any unsatisfactory conditions before proceeding.
- C. If conditions are the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 INSTALLATION - GENERAL

- A. Install pre-engineered building insulation system in accordance with manufacturer's installation instructions and the approved shop drawings.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Install in exterior spaces without gaps or voids. Do not compress insulation.

- D. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
- E. Fit insulation tight in spaces and tight to exterior side of the sealed liner fabric and around mechanical and electrical services within plane of insulation.

3.03 ROOF INSULATION INSTALLATION

- A. Straps:
 - 1. Cut straps to length and install in the pattern and spacings indicated on shop drawings.
 - 2. Tension straps to required value.
- B. Vapor Barrier Fabric:
 - 1. Install vapor barrier fabric in large one-piece custom fabricated pieces to substantially fit defined building areas with minimum practicable job site sealing.
 - 2. Position pre-folded fabric on the strap platform along one eave purlin.
 - 3. Clamp the two bottom corners at the eave and also centered on the bay.
 - 4. Pull the other end of the pleat-folded fabric across the building width on the strap platform, pausing only at the ridge to fasten the straps and fabric in position where plane of roof changes and to release temporary fasteners on the opposite ridge purlins.
 - 5. Once positioned, install fasteners from the bottom side at each strap/purlins intersection.
 - 6. Trim edges and seal along the rafters.
 - 7. All seams must be completely sealed and stapled seams not acceptable.
- C. Insulation:
 - 1. Unpack, and shake to a thickness exceeding the specified thickness.
 - 2. Ensure that cavities are filled completely with insulation.
 - 3. Place on the vapor barrier liner fabric without voids or gaps.
 - 4. Place top layer of insulation over and perpendicular to the purlins without voids or gaps, as roof sheathing is applied.
 - 5. Place thermal block on top of purlins or bottom of purlins for retrofit work, if no other thermal break exists.
 - 6. Place new insulation between purlins at the required thickness for the R-value specified.
- D. Seal vapor barrier fabric to the wall fabric and elsewhere as required to provide a continuous vapor barrier.

3.04 WALL INSULATION INSTALLATION

- A. Insulation:
 - 1. Install thermal break to exterior surface of girts as wall sheathing is applied.
 - 2. (Optional) Install self-sticking foam thermal break to interior surface of girts prior to installation of insulation.
 - 3. Position and secure Fast-R hangers to girts on the inside face of the wall sheathing.
 - 4. Cut insulation to required lengths to fit vertically between girts.
 - 5. Fluff the insulation to the full-specified thickness.
 - 6. Neatly position in place and secure to Fast-R hangers.
 - 7. Ensure that cavities are filled completely with insulation.

- B. Vapor Barrier Fabric:
 - 1. Install vapor barrier fabric in large one-piece custom fabricated pieces to substantially fit defined building areas with minimum practicable job site sealing.
 - 2. Apply the vapor barrier fabric by clamping it in position over eave strap and installing fasteners through the eave strap into each roof strap, permanently clamping the wall fabric between them.
 - 3. Once in position, draw the vapor barrier fabric down over the column flanges to the base angle and install vertical straps along each column and 5 feet 0 inches on center, maximum, fastening to each girt to retain system permanently in place.
 - 4. All seams must be completely sealed and stapled seams not acceptable.
- C. Seal wall fabric to the roof fabric, to the base angle and up the columns to provide a continuous vapor barrier.

3.05 CLEANING

- A. Clean dirt or exposed sealant from the exposed vapor barrier fabric.
- B. Remove scraps and debris from the site.

3.06 PROTECTION

- A. Protect system products until completion of installation.
- B. Repair or replace damaged products before completion of insulation system installation.

3.07 SCHEDULE

- A. Administration Building (90):
 - 1. Ceiling insulation general: R-29.
 - 2. Wall insulation general: R-26.

END OF SECTION

SECTION 07212

BOARD INSULATION

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes rigid board insulation at cavity wall construction.

1.02 REFERENCES

- 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:
 - 1. C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
 - 2. D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics.
 - 3. E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 4. E96 - Standard Test Methods for Water Vapor Transmission of Materials.
- C. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.
- D. UL 723 - Tests for Surface Burning Characteristics of Building Materials.
- E. Green Seal:
 - 1. GS-36 - Aerosol Adhesives.
- F. South Coast Air Quality Management District:
 - 1. SCAQMD Rule 1168 - Adhesive and Sealant Applications.

1.03 DESIGN AND PERFORMANCE CRITERIA

- A. System Description:
 - 1. Materials of This Section: Provide continuity of thermal barrier at building enclosure elements.
 - 2. Materials of This Section: Provide thermal protection to vapor retarder in conjunction with vapor retarder materials in Section 07160.

1.04 SUBMITTALS

- A. Section 01300 - Submittals: Submittal procedures.
- B. Product Data: Submit product data characteristics, performance, limitations, and recommended uses.

- C. Manufacturer's Installation Instructions.
- D. Manufacturer's Compliance Certificate.

1.05 SUSTAINABLE DESIGN SUBMITTALS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
 - 1. Materials Resources Certificates:
 - a. Certify recycled material content for recycled content products.
 - 2. Indoor Air Quality Certificates:
 - a. Certify volatile organic compound content for each interior adhesive and sealant and related primer.

1.06 QUALITY ASSURANCE

- A. Insulation Installed in Concealed Locations Surface Burning Characteristics:
 - 1. Foam Plastic Insulation: Maximum 75/450 flame spread/smoke developed index when tested in accordance with ASTM E84.
 - 2. Other Insulation: Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.
- B. Insulation Installed in Exposed Locations Surface Burning Characteristics: Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.
 - a. Apply label from agency approved by authority having jurisdiction to identify each foam plastic insulation board.

1.07 PROJECT CONDITIONS

- A. Environmental Requirements:
 - 1. Section 01600 - Product Requirements.
 - 2. Do not install adhesives when temperature or weather conditions are detrimental to successful installation.
- B. Sequencing:
 - 1. Sequence Work to dry and protected system installation.
- C. Coordination:
 - 1. Section 01200 – Project Meetings: Coordination and project conditions.

PART 2 PRODUCTS

2.01 BOARD INSULATION

- A. Manufacturers
 - 1. Dow Building Solutions: Super Tuff-R Commercial; or approved equal.

- B. Material: Polyisocyanurate Insulation: ASTM C1289, rigid board, glass fiber reinforced type, conforming to the following:
 - 1. Board Thickness: 2 inches (Electrical Substation), 1 inch (Administration Building).
 - 2. Facing: Aluminum foil on both faces.
 - 3. Compressive Strength: Minimum 25 psi.
 - 4. Thermal Resistance: Aged R of 6/inch minimum.
 - 5. Board Edges: Square.
 - 6. Water Absorption: In accordance with ASTM C272; 0.05 percent by volume maximum.

2.02 SUSTAINABILITY CHARACTERISTICS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design compliance.
- B. Materials and Resources Characteristics:
 - 1. Recycled Content Materials: Furnish materials with maximum available recycled content.
- C. Indoor Environmental Quality Characteristics:
 - 1. Interior Adhesives: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.
 - 2. Interior Aerosol Adhesives: Maximum volatile organic compound content in accordance with GS-36.

2.03 ACCESSORIES

- A. Adhesive Type 1: Type recommended by insulation manufacturer for application.
 - 1. Interior Adhesives: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.
 - 2. Interior Aerosol Adhesives: Maximum volatile organic compound content in accordance with GS-36.
- B. Sheet Vapor Retarder: Specified in Section 07160.
- C. Tape: Type recommended by insulation manufacturer for application.
- D. Insulation Fasteners: Provide insulated sheathing manufacturer's recommended organic-polymer or other corrosion-protective coated steel screw fasteners for anchoring sheathing to metal wall framing. Fastener length and size based on wall sheathing thickness.
 - 1. Acceptable Products: Wind-lock Corporation "ci-Lock Steel Series Selection" with 1-3/4 inch diameter high-grade plastic washers.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify substrate, adjacent materials, and insulation boards are dry and ready to receive insulation and adhesive.
- B. Verify substrate surface is flat, free of honeycomb, fins, irregularities, materials or substances affecting adhesive bond.

3.02 INSTALLATION – EXTERIOR WALLS

- A. Attach polyisocyanurate board to framed back-up wall.
 - 1. Install tracks, expansion joints, back wrap mesh. Or edge wrap mesh at system terminations.
 - 2. Install boards on wall surface horizontally with wind lock fasteners to attach insulation boards to the wall.
 - 3. Place boards in method to maximize tight joints. Stagger vertical joints. Butt edges and ends tight to adjacent board and to protrusions.
 - 4. Secure boards to substrate by mechanical attachment to achieve continuous flush insulation surface. Rasp irregularities if they should occur.
- B. Tape insulation board joints.

3.03 PROTECTION OF INSTALLED

- A. Section 01600 – Product Requirements: Protecting installed construction.
- B. Do not permit work to be damaged prior to covering insulation.

3.04 SCHEDULES

- A. Exterior Wall Insulation at Electrical Substation: 2 inch foil faced Super Tuff R polyisocyanurate.
- B. Interior Partition Insulation at Administration Building: 1 inch foil faced Super Tuff R polyisocyanurate.

END OF SECTION

SECTION 07213

BATT INSULATION

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Encapsulated fiberglass batt insulation to provide a thermal barrier in metal framed walls, thickness to match that of wall framing.
 - 2. Encapsulated fiberglass batt insulation for use in filling gaps at tops of framed walls and other areas to continue insulative between conditioned and unconditioned spaces.
 - 3. Acoustic fiberglass batt insulation for use above Acoustical Ceiling Panels.

1.02 RELATED SECTIONS

- A. Other related work as called for on PLANS or as specified elsewhere in this or other TECHNICAL SPECIFICATIONS sections.

1.03 REFERENCES

- A. The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by basic designation only.
- B. ASTM International:
 - 1. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
 - 2. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 3. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials.
 - 4. ASTM E970 - Standard Test Method for Critical Radiant Flux of Exposed Attic Floor Insulation Using a Radiant Heat Energy Source.
- C. National Fire Protection Association:
 - 1. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.
- D. Underwriters Laboratories Inc.:
 - 1. UL 723 - Tests for Surface Burning Characteristics of Building Materials.

1.01 DESIGN AND PERFORMANCE CRITERIA

- E. System Description
 - 1. Materials of this Section: Provide continuity of thermal barrier at building enclosure elements.

1.04 SUBMITTALS

- A. Furnish the following in accordance with Specification Section 01300 - Submittals.
 - 1. Product Data: Submit data on product characteristics, performance criteria, limitations.
 - 2. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.05 SUSTAINABLE DESIGN SUBMITTALS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
 - 1. Materials Resources Certificates:
 - a. Certify recycled material content for recycled content products.
 - 2. Indoor Air Quality Certificates:
 - a. Certify volatile organic compound content for each interior adhesive and sealant and related primer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Batt Insulation: one of the following or approved equal:
 - 1. Johns Manville.
 - 2. CertainTeed Insulation.
 - 3. Owens Corning Fiberglas.
 - 4. U.S. Gypsum Co. Thermafiber LLC.

2.02 SUSTAINABILITY CHARACTERISTICS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design compliance.
- B. Materials and Resources Characteristics:
 - 1. Recycled Content Materials: Furnish materials with maximum available recycled content.
- C. Indoor Environmental Quality Characteristics:
 - 1. Interior Adhesives: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.
 - 2. Interior Aerosol Adhesives: Maximum volatile organic compound content in accordance with GS-36.

2.03 MATERIAL

- A. Glass-Fiber Blanket Insulation
 - 1. Manufacturers:
 - a. CertainTeed Corporation.
 - b. Guardian Fiberglass, Inc.

- c. Johns Manville.
- d. Knauf Fiber Glass.
- e. Owens Corning.
- 2. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
 - a. Unfaced glass-fiber blanket insulation is for use as acoustical insulation, is to be 3-5/8 inch thick in 24 inch x 48 inch batts at locations indicated.
- 3. Faced, Glass-Fiber Blanket Insulation: ASTM C 665, Type III (blankets with reflective membrane facing), Class A (membrane-faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor barrier), faced with polypropylene-scrim-kraft vapor-retarder membrane on 1 face.
 - a. Where faced glass-fiber blanket insulation is indicated by the following thicknesses, provide blankets in batt or roll form with thermal resistances indicated:
 - 1) 3-5/8 inches thick with a thermal resistance of 11 deg F x h x sq. ft./Btu at 75 deg F.
 - 2) 5-1/2 inches thick with a thermal resistance of 21 deg F x h x sq. ft./Btu at 75 deg F.
 - 3) 9-1/2 inches thick with a thermal resistance of 30 deg F x h sq. ft./Btu at 75 deg F.

B. Auxiliary Insulating Materials

- 1. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by insulation manufacture for sealing joints and penetrations in vapor-retarder facing.
- 2. Single Component Polyurethane Foam Sealants for use around windows, doors etc.
- 3. Vapor Retarder (if required)
- 4. Asphaltic
- 5. Butyl
- 6. Chlorosulfonated Polyethylene
- 7. Polyethylene Film
- 8. Other

PART 3 EXECUTION

3.01 GENERAL

A. Examination

- 1. Verify substrate, adjacent materials, and insulation are dry and ready to receive insulation.

3.02 INSTALLATION

- A. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
- B. Fit insulation tight in spaces and tight to exterior side of mechanical and electrical services within plane of insulation.

- C. Acoustic insulation is to be laid above acoustical ceiling panels on each side of all partitions that do not extend up to deck.

1.02 MEASUREMENT AND PAYMENT

- D. Unless otherwise indicated, no separate measurement or payment for work, performed under this Section. Include cost of same in Contract price bid for work of which this is a component part.

END OF SECTION

SECTION 07214

FOAMED-IN-PLACE INSULATION

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Foamed-in-place insulation in masonry cavity walls and at exterior wall crevices requiring thermal seal.
 - 2. Foamed-in-place insulation at junctions of dissimilar wall and roof materials to achieve thermal seal.

1.02 REFERENCES

- 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:
 - 1. C177 - Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded Hot-Plate Apparatus.
 - 2. D1621 - Compressive Properties of Rigid Cellular Plastics.
 - 3. D1622 - Apparent Density of Rigid Cellular Plastics.
 - 4. C1029 - Spray-Applied Rigid Cellular Polyurethane Insulation Thermal Insulation.
 - 5. D2482 - Wax Pick Test for Surface Strength of Paper.
 - 6. E84 - Surface Burning Characteristics of Building Materials.
 - 7. E96 - Water Vapor Transmission of Materials.
- C. California Department of Health Care Services:
 - 1. CA/DHS/EHLB/R-174 - Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers.
- D. Green Seal:
 - 1. GS-36 - Green Seal Standard for Adhesives for Commercial Use.

1.03 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Provide product description, insulation properties, and preparation requirements.
- C. Manufacturer's Installation Instructions: Indicate special procedures, and perimeter conditions requiring special attention.
- D. Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.

1.04 SUSTAINABLE DESIGN SUBMITTALS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
 - 1. Materials Resources Certificates:
 - a. Certify recycled material content for recycled content products.
 - 2. Indoor Air Quality Certificates:
 - a. Certify volatile organic compound content for each interior adhesive and sealant and related primer.

1.05 QUALITY ASSURANCE

- A. Conform to applicable code for flame and smoke and concealment requirements.
- B. Surface Burning Characteristics for Insulation Installed in Concealed Locations:
 - 1. Foam Plastic Insulation: Maximum 75/450 flame-spread/smoke-developed index when tested according to ASTM E84.
- C. Apply label from agency approved by authority having jurisdiction to identify each foam plastic component.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- B. Store materials according to manufacturer instructions.
- C. Protection:
 - 1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
 - 2. Provide additional protection according to manufacturer instructions.

1.07 PROJECT CONDITIONS

- A. Qualifications:
 - 1. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- B. Regulatory Requirements:
 - 1. Conform to applicable code for flame and smoke, and concealment requirements.
- C. Mockup:
 - 1. Section 01400 - Quality Control Services: Requirements for mockup .
 - 2. Construct mockup, 5 feet long, which includes wall construction, window and frame and door frame. Locate where directed.
 - 3. Mockup may remain as part of the Work.

- D. Pre-Installation Conference:
 - 1. Convene one week prior to commencing work of this section, under provisions of Section 01400 – Quality Control Services: Pre-installation meeting.
- E. Environmental Requirements:
 - 1. Do not install insulation when ambient temperature is lower than 70 degrees Fahrenheit.
- F. Sequencing:
 - 1. Sequence work to ensure timely placement of insulation within construction spaces.

PART 2 PRODUCTS

2.01 MASONRY CORE INSULATION

- A. For use at the exterior envelope within masonry cores.
- B. Manufacturers:
 - 1. CFI Foam, Inc., Core Foam.
 - 2. FDI Enterprises, Tripolymer Foam Insulation.
 - 3. Gaco, CacoProFill FR6500R
 - 4. Tailored Chemical Products, Inc., Core-Fill 500.
 - 5. Or approved equal.

2.02 CRACK AND CREVICE FOAMED-IN-PLACE INSULATION

- A. Manufacturers:
 - 1. DAP, DAPtex Plus Multi-Purpose Foam.
 - 2. Dupont, Great Stuff Gas & Cracks.
 - 3. LocTite, Tite Foam Gaps & Cracks Insulating Foam Sealant.
 - 4. Or approved equal.

2.03 LARGE CRACK AND CREVICE FOAMED-IN-PLACE INSULATION

- A. Manufacturers:
 - 1. DAP, Touch 'n Foam Max Fill.
 - 2. Dupont, Great Stuff Big Gap Filler.
 - 3. LocTite, Tite Foam Big Gaps Insulating Foam Sealant.
 - 4. Or approved equal.

2.04 SUSTAINABILITY CHARACTERISTICS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design compliance.
- B. Materials and Resources Characteristics:
 - 1. Recycled Content Materials: Furnish materials with maximum available recycled content.
- C. Indoor Environmental Quality Characteristics:

1. Interior Adhesives: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.

2.05 MATERIALS

- A. Insulation-Masonry Core:
 1. Material: Polyurethane
 2. Thermal Resistance: R-4.0 when tested according to ASTM C518.
 3. Air Permeance: >0.02 L/s-m² at 3.5 inches when tested according to ASTM E2178.
 4. Density:
 - a. 0.5 pcf minimum.
 - b. Comply with ASTM D1622
- B. Insulation-Crack and Crevice and Large Crack and Crevice:
 1. Material: Polyurethane

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify work within construction spaces or crevices is complete prior to insulation application.
- B. Verify that surfaces are clean, dry, and free of matter that may inhibit insulation application.

3.02 APPLICATION

- A. Apply insulation in accordance with Manufacturer's instructions.
- B. Apply insulation by the pump method, to a uniform monolithic density without voids.
- C. Apply to a thickness sufficient to fill the void.

3.03 FIELD QUALITY CONTROL

- A. Inspection will include verification of insulation thickness and density.

3.04 PROTECTION OF FINISHED WORK

- A. Protect finished Work.

3.05 SCHEDULE

- A. Exterior Walls: Fill cells of Concrete Masonry Units not indicated for grouting, where indicated on the Drawings.
- B. Gaps and crevices not otherwise filled with other insulation at perimeter wall assemblies and as indicated on contract drawings.

END OF SECTION

SECTION 07301

ROOF UNDERLAYMENT

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. This Section specifies a self-adhering sheet membrane used as underlayment for sloped roofs.

1.02 RELATED REQUIREMENTS

- A. The Contract Documents are complementary; what is called for by one is as binding as if called for by all.
- B. It is the CONTRACTOR's responsibility for scheduling and coordinating the Work of subcontractors, suppliers, and other individuals or entities performing or furnishing any of CONTRACTOR's Work.
- C. Related Sections:
 - 1. Section 06100 – Rough Carpentry: Roof sheathing.
 - 2. Section 07415 – Metal Roofing.
 - 3. Section 07468 – Metal Siding.
 - 4. Section 07600 – Flashing and Sheet Metal.
 - 5. Section 07900 – Joint Sealers

1.03 REFERENCES

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.

- A. ASTM International:
 - 1. ASTM D 570 - Test Method for Water Absorption of Plastics.
 - 2. ASTM D 1004 -Test Method for Initial Tear Resistance of Plastic Film and Sheeting.
 - 3. ASTM E 96 - Test Methods for Water Vapor Transmission of Materials.
 - 4. ASTM E 331-86 - Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure.
 - 5. ASTM D 828-93- Tensile Properties of Paper and Paperboard Using Constant-Rate-of-Elongation Apparatus.
 - 6. ASTM 96-95- Water Vapor transmission of Materials.
 - 7. ASTM F 1249-90 – Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor.

1.04 DESIGN AND PERFORMANCE CRITERIA

- A. System Description:
 - 1. Waterproofing System: Vapor permeable, weather resistive barrier which prevents moisture migration to interior.

1.05 SUBMITTALS

- A. Section 01300 - Submittals: Submittal procedures.
- B. Product Data: Submit data for surface conditioner, flexible flashings, joint cover sheet, and joint and crack sealants, with temperature range for application of waterproofing membrane.
- C. Manufacturer's Installation Instructions: Submit special procedures and perimeter conditions requiring special attention.
- D. Warranty: Submit manufacturer warranty and ensure forms have been completed in OWNER's name and registered with manufacturer.

1.06 SUSTAINABLE DESIGN SUBMITTALS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
 - 1. Materials Resources Certificates:
 - a. Certify recycled material content for recycled content products.

1.07 QUALITY ASSURANCE

- A. Perform Work in accordance with NRCA Waterproofing Manual.
- B. Maintain one copy of each document on site.

1.08 PROJECT CONDITIONS

- A. Qualifications:
 - 1. Membrane Manufacturer: Company specializing in waterproofing sheet membranes with minimum three years documented experience.
 - 2. Applicator: Company specializing in performing the work of this section.
- B. Mock-Up:
 - 1. Construct Mock-up of 100 square feet waterproofed panel; to represent finished work including internal and external corners, seam jointing, attachment method, Counterflashing cover, base flashings, control and expansion joints.
 - 2. Mock-up may remain as part of the Work.
- C. Pre-Installation Meeting:
 - 1. Section 01400 – Quality Control Services: Pre-installation meeting.
 - 2. Convene minimum one week prior to commencing work of this section.
- D. Environmental Requirements:
 - 1. Maintain ambient temperatures above 40 degrees Fahrenheit for 24 hours before and during application and until liquid or mastic accessories have cured.

1.09 WARRANTY

- A. Section 01700 - Contract Closeout: Product warranties and product bonds.
- B. Provide five-year manufacturer warranty for waterproofing failing to resist penetration of water.

PART 2 PRODUCTS

2.01 WEATHER RESISTIVE BARRIER

- A. Manufacturers:
 - 1. Dupont Corporation, Tyvek Commercial wrap and seal/flashing system.
 - 2. Or approved equal.

2.02 MOISTURE BARRIER

- A. Moisture Barrier: Class C, Flash spun bonded, high density polyethylene fiber non woven membrane, 5 to 7 mm thick.

2.03 SUSTAINABILITY CHARACTERISTICS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design compliance.
- B. Materials and Resources Characteristics:
 - 1. Recycled Content Materials: Furnish materials with maximum available recycled content.

2.04 COMPONENTS

- A. Membrane: Tyvek Commercial Wrap.
- B. Transition Flashing: Tyvek Flex wrap and straight flash.
- C. Self Adhesive Tape: Tyvek, to meet the needs of the wrap and flash system.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Section 01200 – Project Meetings: Coordination and project conditions.
- B. Verify substrate surfaces are durable; free of matter detrimental to adhesion or application of waterproofing system.
- C. Verify items which penetrate surfaces to receive waterproofing are securely installed.
- D. Verify substrate surface slopes to drain for horizontal waterproofing applications.

3.02 PREPARATION

- A. Protect adjacent surfaces not designated to receive waterproofing.
- B. Clean and prepare surfaces to receive waterproofing.
- C. Do not apply weather barrier to surfaces unacceptable to manufacturer.
- D. Seal cracks and joints with sealant materials using depth to width ratio in accordance with Section 07900.

3.03 INSTALLATION - MECHANICALLY ATTACHED WEATHER BARRIER

- A. Roll out membrane. Minimize wrinkles.
- B. Install mechanical fasteners in accordance with manufacturer's seven step installation process instructions.
- C. Overlap edges and ends.
- D. Weather lap joints on sloped substrate in direction of drainage.
- E. Seal items protruding to or penetrating through membrane and install Counterflashing membrane material.
- F. Installation: Self Sealant Flashing Around Windows.
 - 1. Flashing is first applied at the sill and then jambs of window openings.
 - 2. Overlap edges minimum of 3 inches on each side.

3.04 PROTECTION OF INSTALLED CONSTRUCTION

- A. Section 01700 - Contract Closeout: Protecting installed construction.
- B. Do not leave installed membrane exposed for longer than 90 days. Replace with new any layers exposed after 90 days.

3.05 SCHEDULE

- A. Exterior Surface Over all Sheathing: One ply of membrane weather barrier over sheathing; tape over membrane joints.
- B. Self-Adhesive Flashing: Around windows and penetrations.
 - 1. Straight flash on vertical transitions to windows doors and storefronts.
 - 2. Flex wrap on horizontal transition applications and noted conditions.

END OF SECTION

SECTION 07415

METAL ROOFING

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Preformed metal roofing, fascia, and associated accessories.

1.02 REFERENCES

- 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. American Society for Testing and Materials (ASTM):
 - 1. A 653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical Quality), Grade 40.
 - 2. B 32 - Standard Specification for Solder Metal.
 - 3. D 2626 - Standard Specification for Asphalt-Saturated and Coated Organic Felt Base Sheet Used in Roofing.
- C. Sheet Metal and Air Conditioning Contractors:
 - 1. SMACNA - Architectural Sheet Metal Manual.
- D. U.S. Environmental Protection Agency:
 - 1. ENERGY STAR - ENERGY STAR Voluntary Labeling Program.

1.03 DESIGN AND PERFORMANCE CRITERIA

- A. System Description:
 - 1. Design Requirements: Roofing assemblies to include preformed sheet metal panels, related accessories, ridges, eaves, corners, rakes, miscellaneous flashing and attaching devices installed per UL 90 wind uplift requirements.
 - 2. Design and manufacture roof decking in accordance with the International Building Code:
 - a. Live Load Design: 20 pounds per square foot.
 - b. Uplift for a Wind: As specified in Section 01614 - Wind Design Criteria.
 - c. Roofing system shall be suitable for wet reservoir environment.

1.04 SUBMITTALS

- A. Submit in accordance with Section 01300 - Submittals.
- B. Shop Drawings: Include thicknesses and dimensions of parts, fastening and anchoring methods, details and locations of seams, joints and other provisions for thermal movement. Show plans and elevations at minimum scale of 1/4 inch to 1 foot, and details at minimum scale of 3 inches to 1 foot.
- C. Product Data: Include standard color and finish options.

- D. Samples: Include 8 inch square samples of color and finish on specified substrate.
- E. Manufacturer's Installation Instructions.
- F. Certificates: Manufacturer's approval of Installer and Shop Drawings.
- G. Maintenance Data.
- H. Warranty.

1.05 SUSTAINABLE DESIGN SUBMITTALS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design submittals.
- B. Fabricator's Certificate: Certify products meet or exceed specified sustainable design requirements.
 - 1. Sustainable Sites Certificates:
 - a. Certify roofing materials solar reflectance index (SRI).
 - 2. Materials Resources Certificates:
 - a. Certify recycled material content for recycled content products.

1.06 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer approved installer of products similar to specified products on minimum 5 projects of similar scope as Project with satisfactory performance record.
- B. Exposed sheet metal material used for roofing, including roofing panels, flashings, closures, and other trim shall be product of one manufacturer.
- C. Other materials shall be products approved or recommended by roofing system manufacturer.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products in accordance with manufacturer's recommendations.

1.08 WARRANTY

- A. Installer's Warranty: Warrant all materials and installation of roof system for two (2) years against leaks and defects in materials and workmanship.
- B. Manufacturer's Warranties:
 - 1. Provide standard 20-year water-tightness warranty
 - 2. Provide pre-finished metal with a standard twenty (20) year finish warranty.
- C. Warranties shall commence on the date of Substantial Completion for the overall project.

PART 2 PRODUCTS

2.01 SUSTAINABILITY CHARACTERISTICS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design compliance.
- B. Sustainable Sites Characteristics:
 - 1. Roof Surfaces:
 - a. Comply with ENERGY STAR.
 - b. Minimum Emissivity: 0.9 for 75 percent of roof area, according to ASTM E408.
- C. Materials and Resources Characteristics:
 - 1. Recycled Content Materials: Furnish materials with maximum available recycled content.

2.02 MANUFACTURERS

- A. Preformed Metal Roofing: One of the following or equal:
 - 1. MBCI Systems, San Antonio, Texas
 - a. BattenLok HS Panel, with Striations
 - 2. Berridge Manufacturing Co., Houston, TX; equivalent product.
 - 3. Commercial Siding and Maintenance Co., Houston TX; equivalent product.
- B. Pac Clad, Tyler, TX; equivalent product.

2.03 PREFORMED METAL ROOFING

- A. System: Double seamed, sheet steel roofing system, including fascia, flashing, and sealants.
- B. Panel Spacing: 16 inches on center.

2.04 EXPOSED COMPONENTS

- A. Sheet Steel: ASTM A 653, G90 minimum coating designation, minimum 22 gauge.
- B. Protective Coating Galvalume/Zincalume conforming to ASTM A-792, AZ50, thickness 1.6 mils.
- C. Finish:
 - 1. Factory finished Galvalume Plus.
 - a. Solar reflectance index: 56.
- D. Surfaces must be prepared in accordance with coating manufacturer's recommendations.

2.05 ACCESSORIES

- A. Underlayment:
 - 1. Manufacturer's: One of the following or approved equal:
 - a. Grace Ice & Water Shield.

- b. Hybase SAM by Hyload Inc.
 - c. Interwrap Titanium PSU-30.
- B. Hold-down Clips: Stainless steel of type that will allow thermal movement of roof panels.
- C. Closures: System manufacturer's standard neoprene blocks shaped to fit roof metal profile.
- D. Solder: ASTM B 32 alloy composition SN 50.
- E. Fasteners:
 - 1. Nails, Screws, Rivets, and Other Fasteners: Stainless steel or alloy appropriate to roofing metal.
 - 2. Nails: Ringed or twisted shank type, of lengths required.
 - 3. Screws: Stainless steel pan head wood or sheet metal screws for use with hold-down clips.
- F. Sealant: As specified in Section 07900, unless recommended otherwise by panel manufacturer

2.06 FABRICATION

- A. Panels: Fabricate with upturned edges to form standing seam joints with 2 inch nominal high edges. Fabricate to extend from eaves to ridge in a single length, with no end laps.
- B. Seams: Approximately 2 inches high, nominal, and evenly spaced approximately 16 inches on center.
- C. Ridge, Hips, Eaves, Rakes, Fascia, Coping, and Other Exposed Flashings: Form of sheet steel matching roofing to provide weathertight roofing system.
- D. Form sheets, battens, strips, cleats, valleys, ridges, edge treatments, integral flashings, gutters, downspouts, and other components to profiles indicated on the Drawings and required for permanent leak proof construction.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify governing dimensions at building.
- B. Verify that substrate is firm, dry, and free of foreign materials.

3.02 PREPARATION

- A. Clean and repair adjoining surfaces when necessary for proper installation of preformed metal roofing panels.

3.03 UNDERLAYMENT

- A. Apply single-ply of underlayment, lapped shingle fashion, 3 inch head laps and 6 inch side laps.
- B. Install no more underlayment than can be covered by metal roofing in a single day.

3.04 ROOFING

- A. Install roofing in accordance with manufacturer's recommendations.
- B. Lay out pattern to place batten seams equidistant from corners and aligned with seams on other side of hip or ridge.
- C. Start installation from eaves.
- D. Secure roofing panels in place with concealed clips and fasteners. Exposed fasteners through roof panels, batten covers and flashings shall not be used.
- E. Locate clips in joints within 6 inches of panel ends.
- F. At eaves, cut upturned edges and bend panel down to form fascia.
- G. At intersections of roof slope with ridge and hips, turn up edges of roof panels 1 inch.
- H. Exposed batten ends to have neoprene closures, or watertight cap.
- I. Form valleys of sheets not exceeding 10 feet in length.
- J. Lap joints 6 inches in direction of drainage.
- K. Extend valley sheet minimum of 6 inches under roofing sheets.
- L. At valley, double fold valley and roofing sheets and secure with cleats spaced 18 inches on center.
- M. Install ridge and hip covers securely in place using Z closer clips and fasteners.
- N. Seal joints where necessary for watertightness.
- O. Completed roof shall be watertight.
- P. Exposed surfaces shall be free of dents, scratches, abrasions, stains, and other visible defects.

3.05 CLEANING

- A. Clean any grease, finger marks or stains from the panels per manufacturer's recommendations

3.06 FIELD QUALITY CONTROL

- A. Field inspection will be performed under provisions of Division 1.

3.07 PROTECTION OF FINISHED WORK

- A. Protect finished Work under provisions of Section 01600 – Product Requirements.
- B. Do not permit traffic over unprotected roof surface.

3.08 SCHEDULE

- A. Substation #1 (85) sloped roof, Galvalume Finish.
- B. Administration Building (90) sloped roof, Galvalume Finish.

END OF SECTION

SECTION 07468

METAL SIDING

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Metal siding and soffit systems.
 - 2. Related flashings and accessory components.

1.02 REFERENCES

- 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. SMACNA: "Architectural Sheet Metal Manual" Sheet Metal and Air Conditioning Contractors National Association, Inc.
- C. AISC:
 - 1. "Steel Construction Manual" American Institute of Steel Construction.
 - 2. "Cold Form Steel Design Manual," American Iron and Steel Institute.
- D. ASTM International:
 - 1. A 606 - Steel Sheet and Strip, Hot-Rolled and Cold-Rolled, High-Strength, Low-Alloy, with Improved Atmospheric Corrosion Resistance.
 - 2. A 792-83-AZ50 - Steel Sheet, Metallic Coated by the Hot-Dip Process and Pre-painted by the Coil Coating Process For Exterior Exposed Building Products.

1.03 DESIGN AND PERFORMANCE CRITERIA

- A. System Description:
 - 1. System: Preformed and prefinished metal siding system of horizontal profile; site assembled.
- B. Performance Requirements:
 - 1. Components: Design and size components to withstand dead and live loads caused by positive and negative wind pressure acting normal to plane of wall as calculated in accordance with applicable code.
 - 2. Maximum Allowable Deflection of Panel: 1/180 of span.
 - 3. Movement: Accommodate movement within system without damage to components or deterioration of seals, movement within system; movement between system and perimeter components when subject to seasonal temperature cycling; dynamic loading and release of loads; deflection of structural support framing.
 - 4. Drainage: Provide positive drainage to exterior for moisture entering or condensation occurring within panel system

1.04 SUBMITTALS

- A. Section 01300 - Submittals: Submittal procedures.
- B. Shop Drawings: Indicate dimensions, layout, joints, expansion joints, construction details, methods of anchorage, and interface with adjacent materials.
- C. Product Data: Submit data on panels.
- D. Design Data: Submit design calculations.
- E. Samples: Submit two samples of siding 12 in long section illustrating finish color, sheen, and texture.
- F. Manufacturer's Installation Instructions: Submit special procedures.

1.05 SUSTAINABLE DESIGN SUBMITTALS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
 - 1. Materials Resources Certificates:
 - a. Certify recycled material content for recycled content products.

1.06 QUALITY ASSURANCE

- A. Fire Rated Wall Construction: Rating as indicated on Drawings.
 - 1. Tested Rating: Determined in accordance with ASTM E119.
- B. Surface Burning Characteristics:
 - 1. Insulation: Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.
- C. Apply label from agency approved by authority having jurisdiction to identify each foam plastic insulation material.
- D. Maintain one copy of each document on site.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.
- B. Store prefinished material off ground protected from weather, to prevent twisting, bending, or abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- C. Prevent contact with materials which may cause discoloration or staining.

1.08 PROJECT CONDITIONS

- A. Qualifications:
 - 1. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
 - 2. Installer: Company specializing in performing Work of this section with minimum three years documented experience.

- B. Mock-Up:
 - 1. Construct mock-up, 10 feet by 10 feet, which includes siding, corner construction, attachments to building frame, associated vapor retarder and air seal materials, weep drainage system, sealants and seals, and related insulation, flashings and accessory components.
 - 2. Locate where directed.
 - 3. Mock-up may remain as part of the Work.

- C. Coordination:
 - 1. Coordinate Work for installation of vapor retarder and air barrier seals.

1.09 WARRANTY

- A. Provide ten-year manufacturer warranty for metal siding integrity and finish.

PART 2 PRODUCTS

2.01 MANUFACTURED METAL SIDING

- A. Manufacturers: One of the following or approved equal:
 - 1. MBCI Systems, San Antonio, Texas.
 - 2. Berridge Manufacturing Co., Houston, Texas.
 - 3. Commercial Siding and Maintenance Co., Houston, Texas.

2.02 SUSTAINABILITY CHARACTERISTICS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design compliance.

- B. Materials and Resources Characteristics:
 - 1. Recycled Content Materials: Furnish materials with maximum available recycled content.

2.03 PANEL MATERIALS

- A. Interior Wall Panel:
 - 1. Basis of Design: MBCI Systems, PBD Panel.
 - 2. Equivalent product from other manufacturer.
 - a. Finish: Siliconized Polyester finish; Color to be selected from Manufacturers full line of colors.
 - b. Configuration: install seams vertically.

- B. Exterior Wall Panel:
 - 1. Basis of Design: MBCI Systems, 7.2 Panel.

2. Equivalent product from other manufacturer.
 - a. Finish: Factory applied Kynar 500; Color to be selected from Manufacturers full line of colors.
 - b. Configuration: install seams vertically.
- C. Base Metal: Steel conforming to ASTM A-446 grade C, 80 KSI minimum yield, thickness 26 gauge minimum, or as noted.
- D. Protective Coating Galvalume/Zincalume conforming to ASTM A-792, AZ50, thickness 1.6 mils.
- E. Finish: Factory applied Kynar 500; Color to be chosen by Architect from Manufacturers full line of colors

2.04 MISCELLANEOUS SHEET MATERIALS

- A. Minimum 22 gauge thick steel stock.
 1. All miscellaneous components to be by same manufacturer.
 2. Galvanized Steel: ASTM A792/A792M-AZ50, or AZ55, Grade 50 Coating Designation.
 3. Pre-coated Surfaces: Kynar.
- B. Internal and External Corners: Same material, thickness, and finish as exterior sheets; profile to suit system; shop cut and factory mitered to required angles. Mitered internal corners to be back braced with 22 gauge thick pre-coated sheet stock to maintain continuity of profile.
- C. Trim, Closure Pieces, Caps, and Flashings: Same material, thickness and finish as exterior sheets; brake formed to required profiles.
- D. Anchors: Galvanized steel

2.05 ACCESSORIES

- A. Closure Strips: Pre-molded flexible, cross-linked, closed cell gray polyethylene foam to fit the contour of the panel specified.
- B. Sealants: Specified in Section 07900.
- C. Fasteners: Manufacturer's standard type to suit application; with soft neoprene washers; fastener cap same color as exterior panel.
- D. Field Touch-up Paint: As recommended by panel manufacturer.
- E. Bituminous Paint: Asphalt base.
- F. Insulation: radiant barrier bubble foil insulation, where indicated on Drawings.
 1. Eco Foil, Urbana, IA; Double Bubble foil insulation
 2. Or approved equal.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify building framing members are ready to receive panel system.

3.02 INSTALLATION

- A. Protect surfaces in contact with cementitious materials and dissimilar metals with bituminous paint. Allow to dry prior to installation.
- B. Install as per manufacturer's Design Manual.
- C. Fasten siding to structural supports; aligned, level, and plumb.
- D. Locate joints over supports. Lap panel ends minimum 4 inches.
- E. Seal and place gaskets to prevent weather penetration. Maintain neat appearance.

3.03 ERECTION TOLERANCES

- A. Maximum Offset from True Alignment between Adjacent Members Butting or In Line: 1/16 inch.
- B. Maximum Variation from Plane or Location Indicated on Drawings: 1/8 inch.

3.04 CLEANING

- A. Section 01700 – Contract Closeout: Final cleaning.
- B. Remove site cuttings from finish surfaces.
- C. Clean and wash prefinished surfaces with mild soap and water; rinse with clean water.

END OF SECTION

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SECTION 07600

FLASHING AND SHEET METAL

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: flashing, sheet metal, and associated accessories.

1.02 REFERENCES

- A. The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by basic designation only.
- B. Aluminum Association (AA):
 - 1. 35-80 - Aluminum Sheet Metal Work in Building Construction (Construction Manual Series Section 5).
- C. ASTM International (ASTM):
 - 1. A 240 - Standard Specification for Heat-resisting Chromium And Chromium-nickel Stainless Steel Plate, Sheet, and Strip For Pressure Vessels.
 - 2. A 653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip.
 - 3. B 32 - Standard Specification for Solder Metal.
 - 4. B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 - 5. B 221 - Standard Specification for Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes.
 - 6. B 224 - Standard Classification of Coppers.
 - 7. B 370 - Standard Specification for Copper Sheet and Strip for Building Construction.
 - 8. B 749 - Standard Specification for Lead and Lead Alloy Strip, Sheet, and Plate Products.
 - 9. D226 - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
 - 10. D 4586 - Standard Specification for Asphalt Roof Cement, Asbestos-Free.
- D. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA):
 - 1. Architectural Sheet Metal Manual.

1.03 SUBMITTALS

- A. Product data.
- B. Shop drawings: Show fabrication details, material profiles, connections, jointing pattern, jointing details, fastening methods, isolation methods, and installation details.
- C. Manufacturer's Installation Instructions.

1.04 SUSTAINABLE DESIGN SUBMITTALS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
 - 1. Materials Resources Certificates:
 - a. Certify recycled material content for recycled content products.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Stack preformed material to prevent twisting, bending, or abrasion, and to provide ventilation.
- B. Prevent contact with materials during storage which may cause discoloration, staining, or damage.

1.06 PROJECT CONDITIONS

- A. Coordinate sheet metal installation with installation of materials specified in Section 410S – Concrete Structures, 04220 – Concrete Masonry Units, 06100 – Rough Carpentry, 07415 – Metal Roofing, 07468 – Metal Siding, 07900 – Joint Sealers, and 15050 – Common Work Results for Mechanical Equipment.

PART 2 PRODUCTS

2.01 SUSTAINABILITY CHARACTERISTICS

Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design compliance.

- A. Materials and Resources Characteristics:
 - 1. Recycled Content Materials: Furnish materials with maximum available recycled content.

2.02 MATERIALS

- A. Aluminum extrusions: ASTM B 221, alloy 6063-T42.
- B. Aluminum sheet: ASTM B 209, 5005-H14 alloy and temper; minimum 32 mils thick, mill at locations not visible and shop pre-coated with three coat fluoropolymer top coat, color to be selected from manufacturer's standard colors, when exposed.
- C. Galvanized steel sheet: ASTM A 653, G-90 minimum 24 gauge thick, with 1.25 ounce coating.
- D. Galvanized steel sheet, pre-coated: ASTM A 653, 24 gauge core steel, pre-coated with factory Galvalume finish.
- E. Stainless steel: ASTM A 240, Type 304 or 316 as indicated on the Drawings, soft temper; minimum 26 gauge thick; smooth finish.

- F. Accessories:
1. Fasteners and metal washers: Types best suited for purpose, of same material as sheet metal being fastened or of composition that will not support electrolysis, such as Type 18-8 stainless steel for fastening aluminum.
 2. Sealer washers: Rubber type, minimum 0.040 inch thick.
 3. Underlayment: ASTM D 226; Number 30 asphalt saturated roofing felt.
 4. Metal primer: type suitable for application and material being primed.
 5. Protective backing paint: Bituminous.
 6. Slip sheet: Rosin sized building paper.
 7. Bedding compound: Rubber-asphalt type.
 8. Roof cement: ASTM D 4586, plastic asphaltic cement.
 9. Solder: ASTM B 32; type suitable for application and material being soldered.

2.03 FABRICATION

- A. Form sheet metal true to shape, accurate in size, square, and free from distortion or defects.
- B. Form rises and angles into flashing true and straight, with exposed surfaces free from waves and buckles.
- C. Fabricate cleats and starter strips of same material as sheet, minimum 3 inches wide, interlockable with sheet.
- D. Form pieces in longest practical lengths. Size and space joints to provide adequate movement for thermal expansion and contraction.
- E. Hem exposed edges on underside 1/2 inch; miter and seam corners.
- F. Form material with flat lock seams, except where otherwise indicated. At moving joints, use sealed interlocking hooked seams.
- G. Solder and seal metal joints. After soldering, remove flux. Wipe and wash solder joints clean.
- H. Fabricate corners from 1 piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.
- I. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip. Fabricate flashings to allow toe to extend a minimum 2 inches over roofing. Return and break edges.
- J. Finish
1. Prepare and prime exposed ferrous metal surfaces.
 2. Backpaint concealed metal surfaces with protective backing paint to minimum dry film thickness of 15 mil.
 3. Provide Galvalume coating for any steel flashing and trim associated with Galvalume roofs.

PART 3 PRODUCTS

3.01 GENERAL

- A. Verify roof openings, curbs, pipes, sleeves, ducts, or vents through roof are solidly set, cant strips and reglets in place, and nailing strips located.
- B. Verify membrane termination and base flashings are in place, sealed, and secure.

3.02 INSTALLATION

- A. Install flashing and sheet metal in accordance with AA and SMACNA references, and when in connection with roofing, roofing manufacturer's specifications.
- B. Install sheet metal to even smooth, sound, thoroughly clean and dry surfaces, free from defects that could affect installation.
- C. Install flashings where necessary to provide leakproof conditions.
- D. Isolate dissimilar metals from direct contact with protective backing paint.
- E. Install starter, edge strips, and cleats before starting installation.
- F. Perform cutting, fitting, drilling, and other operations in connection with sheet metal required to accommodate work of other sections.
- G. Install sealer washers under metal washers or fastener heads where weathertightness is required.
- H. Install surface mounted reglets true to lines and levels. Seal top of reglets with sealant.
- I. Insert counterflashings into reglets to form tight fit.
- J. Seal flashings into reglets with sealant.
- K. Secure flashings in place using concealed fasteners. Use exposed fasteners only in locations acceptable to the ENGINEER.
- L. Seam and seal joints. Make connections watertight and weathertight.
- M. Apply roof cement compound between metal flashings and felt flashings. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and line accurate to profiles.
- N. Seal metal joints watertight.

END OF SECTION

SECTION 07714

GUTTERS AND DOWNSPOUTS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Galvalume Core steel and Kynar Finish gutters, and downspouts at Buildings.
 - 2. Splash pads.

1.02 REFERENCES

- 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:
 - 1. A653/A653M - Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated by the Hot-Dip Process.
 - 2. A924/A924M - Steel Sheet, Aluminum-Zinc Alloy Coated by the Hot-Dip Process, Structural (Physical) Quality.
- C. SMACNA (Sheet Metal and Air Conditioning Contractors National Association) - Architectural Sheet Metal Manual.
- D. ASTM International:
 - 1. ASTM A792 - Standard Specification for Steel Sheet, 55 Percent Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.

1.03 DESIGN AND PERFORMANCE CRITERIA

- A. Conform to applicable code for size and method of rain water discharge.

1.04 SUBMITTALS

- A. Section 01300 - Submittals: Submittal procedures.
- B. Shop Drawings: Indicate locations, configurations, jointing methods, fastening methods, locations, and installation details.

1.05 SUSTAINABILITY CHARACTERISTICS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design compliance.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
 - 1. Materials Resources Certificates:
 - a. Certify recycled material content for recycled content products.

1.06 QUALITY ASSURANCE

- A. Perform Work in accordance with SMACNA Manual.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Prevent contact with materials during storage that may cause discoloration, staining, or damage.

1.08 PROJECT CONDITIONS

- A. Coordination:
 - 1. Section 01300 - Submittals: Coordination and project conditions .

1.09 WARRANTY

- A. Section 01700 – Contract Closeout: Product warranties and product bonds.
- B. Provide twenty (20) year manufacturer warranty for gutter and downspout finishes.

PART 2 PRODUCTS

2.01 GUTTERS AND DOWNSPOUTS

- A. Gutters: Sheet metal; SMACNA Round Type or profile as indicated on drawings.
- B. Downspouts: Sheet metal; SMACNA Round.
- C. Splash Pads: Precast concrete type and profiles indicated; minimum 3000 psi at 28 days, with minimum 5 percent air entrainment.
 - 1. Minimum size: 12"x24"; 30 lbs.

2.02 SUSTAINABILITY CHARACTERISTICS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design compliance.
- B. Materials and Resources Characteristics:
 - 1. Recycled Content Materials: Furnish materials with maximum available recycled content.

2.03 COMPONENTS

- A. Pre-Coated Steel Sheet: ASTM A792, with factory Galvalume Finish, 24 gauge.
- B. Accessories:
 - 1. Anchors and Supports: Profiled to suit gutters and downspouts.
 - 2. Anchoring Devices: Type recommended by fabricator.
 - 3. Gutter Supports: Brackets
 - 4. Downspout Supports: Straps.
 - a. Fasteners: Galvanized steel.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Section 01200 – Project Meetings: Coordination and project conditions .
- B. Verify surfaces are ready to receive gutters and downspouts.

3.02 INSTALLATION

- A. Sheet Metal: Join lengths with seams sealed watertight. Flash and seal gutters to downspouts and accessories.
- B. Slope gutters 1/8-inch per foot minimum.
- C. Set splash pads under downspouts.

3.03 SCHEDULE

- A. Filters and UV Facility (50):
 - 1. Two (2) single slope round gutters, 8-inch diameter.
 - 2. Two (2) round downspouts (on South side), 6-inch diameter.
- B. Operations Building (80):
 - 1. Two (2) single slope round gutters, 8-inch diameter.
 - 2. Two (2) round downspouts, 6-inch diameter.
- C. Substation #1 (85):
 - 1. Two (2) double slope, center peaked, round gutter, 6-inch diameter.
 - 2. Four (4) round downspouts, 5-inch diameter.
 - 3. Concrete splash pads at all downspouts.
- D. Administration Building (90):
 - 1. One (1) double slope, center peak, round gutter, 8-inch diameter.
 - 2. Two (2) round downspouts, 6-inch diameter.

END OF SECTION

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SECTION 07900

JOINT SEALERS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Joint sealers, including sealants, sealant backup, and associated materials.

1.02 REFERENCES

- 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. American Society for Testing Materials (ASTM):
 - 1. C 790 – Use of Latex Sealing Compounds.
 - 2. C 804 – Use of Solvent-Release Type Sealants.
 - 3. C 920 – Standard Specification for Elastomeric Joint Sealants.
 - 4. D 412 – Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers – Tension.
 - 5. D 624 – Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomer.
 - 6. D 1056 – Flexible Cellular Materials Sponge or Expanded Rubber.
 - 7. D 1565 – Flexible Cellular Materials Vinyl Chloride Polymers and Copolymers (Open-Cell Foam).
- C. Federal Specification (FS):
 - 1. FS TT-S-00227e – Sealing Compound, Elastomeric Type, Multi-Component.
- D. National Sanitation Foundation (NSF):
 - 1. Standard 61 – Drinking Water System Components – Health Effects.
- E. SWRI (Sealant, Waterproofing and Restoration Institute) – Sealant and Caulking Guide Specification.
- F. South Coast Air Quality Management District (SCAQMD):
 - 1. SCAQMD Rule 1168 – Adhesive and Sealant Applications.

1.03 SUBMITTALS

- A. Submit under provisions of Section 01300 - Submittals.
- B. Product Data: Provide data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations, and color availability.
- C. Samples: Submit two color selectors illustrating sealant colors for selection.
- D. Manufacturer's Installation Instructions: Indicate special procedures, surface preparation, perimeter conditions requiring special attention.

1.04 SUSTAINABLE DESIGN SUBMITTALS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
- C. Certify volatile organic compound content for each interior adhesive and sealant and related primer.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Perform acoustical sealant application work in accordance with ASTM C919.
- C. Maintain one copy of each document on site.

1.06 QUALIFICATIONS

- A. Manufacturer Qualifications: Manufacturer of proposed product for minimum 5 years with satisfactory performance record.
- B. Installer Qualifications: Manufacturer approved installer of products similar to specified products on minimum 5 projects of similar scope as Project with satisfactory performance record.

1.07 PROJECT/SITE CONDITIONS

- A. Environmental Requirements: Do not apply sealant on wet or frosty surfaces or when surface temperature is higher than 120 degrees Fahrenheit or lower than recommended by the manufacturer.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products in accordance with manufacturer's recommendations.
- B. Code date packages. Do not use material older than 6 months old. Store materials at temperatures lower than 80 degrees Fahrenheit.

1.09 SEQUENCING AND SCHEDULING

- A. Coordinate the work with all sections referencing this Section.
- B. Caulk joints prior to painting.

1.10 WARRANTY

- A. Guarantee all Work for a period of one year from Substantial Completion of the project, in accordance with the General Conditions of the Contract.

- B. In addition to CONTRACTOR's required 1-year warranty, warrant to correct defective products for minimum 5 years in accordance with manufacturer's standard warranty.

PART 2 PRODUCTS

2.01 SUSTAINABILITY CHARACTERISTICS

- A. Section 01352 – sustainable construction requirements: requirements for sustainable design compliance.
- B. Indoor environmental quality characteristics:
 - 1. Interior Sealants and Sealant Primers: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168

2.02 MANUFACTURERS

- A. Manufacturers: One of the following or approved equal:
 - 1. BASF Sonneborn.
 - 2. Dow Corning.
 - 3. Sika.
 - 4. Pacific Polymers.
 - 5. BASF Watson Bowman Acme.

2.03 MATERIALS – GENERAL

- A. Compatibility: Provide joint sealants, backings and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.
- B. VOC Content: Provide all interior sealants and sealant primers that comply with the SCAQMD Rule 1168.
- C. Colors of Exposed Joint Sealants: As selected by ENGINEER from manufacturer's full range of colors.

2.04 TYPE A: SYNTHETIC RUBBER SEALING COMPOUND

- A. Manufacturer: One of the following or equal:
 - 1. Sika Corporation, Lyndhurst, NJ, Sikaflex 2c NS or SL
 - 2. Pacific Polymers, Garden Grove, CA, Elastothane 227R.
- B. Material: In accordance with ASTM C 920 Type M, Grade P (pourable), Class 25 and Type M, Grade NS (non-sag), Class 25; multi-part polyurethane; able to cure at room temperature to firm, highly resilient rubber; able to perform satisfactory when continuously submerged in water or sewage and exposed to direct sunlight in dry condition; with the following properties determined at 75 degrees Fahrenheit and 50 percent relative humidity:
 - 1. Base: Polyurethane rubber.
 - 2. Solids: Minimum 97 percent.
 - 3. Application time: Minimum 2 hours.

4. Cure time: Maximum 3 days.
5. Tack free time: 24 hours.
6. Ultimate hardness: Non-sag 25, Pourable/SL 40, within 5 Shore A.
7. Tensile strength: Non-sag 120 pounds per square inch minimum and Self-leveling minimum 170 pounds per square inch when tested in accordance with ASTM D 412.
8. Ultimate elongation: Minimum 490 percent when tested in accordance with ASTM D 412.
9. Tear resistance: Non-sag 45 pounds per inch minimum and Self-leveling minimum 85 pounds per inch when tested in accordance with ASTM D 624, Die C.
10. Service temperature range: Minus 25 degrees to 158 degrees Fahrenheit.

C. Color: Gray to match concrete, unless indicated on the Drawings.

2.05 TYPE B: SINGLE COMPONENT NEUTRAL CURING SILICONE SEALANTS

- A. BASF Sonneborn – Omniseal 50; Type S (single component), Grade NS (nonsag), Use NT (nontraffic), M, A, G and O; VOC content <250 g/L.

2.06 SYNTHETIC SPONGE RUBBER FILLER

- A. Closed-cell expanded sponge rubber manufactured from synthetic polymer neoprene base, or resilient polyethylene foam backer rod. Manufacturers: One of the following or equal:
1. Presstite, Number 750.3 Ropax Rod Stock.
 2. Rubatex Corp., Rubatex-Cord.
- B. Characteristics:
1. Suitable for application intended.
 2. Strength: As necessary for supporting sealing compound during application.
 3. Resiliency: Sufficient resiliency to prevent significant load transfer across joint.
 4. Resistance to environmental conditions of installation.
 5. Bonding: No bonding to the sealing compound.
 6. Structure: Cellular, prevents wicking or absorption of water.
 7. Compatibility with other materials in joint and acceptance by manufacturer of sealing compound.
 8. Size: Minimum 25 percent greater than nominal joint width.

2.07 NEOPRENE RUBBER SEAL

- A. Manufacturer: One of the following or approved equal:
1. BASF Watson Bowman Acme; Jeene Expansion Joint Sealant System:
 - a. Horizontal applications: FW-Series profile.
 - b. Vertical applications: W-Series profile.
- B. The structural sealing joint profile shall be preformed and manufactured from an extruded neoprene compound exhibiting the physical properties listed below:
1. Tensile Strength: 2,000 psi.
 2. Elongation at break: 250%, min.
 3. Hardness, Type A Durometer: 65 +/- 5%.
 - a. Low temp stiffening 7 days @ 14°F: 0-15.

4. Oven aging 70 hrs @ 212 degrees F.
 - a. Tensile strength: 20% loss max.
 - b. Elongation: 20% loss max.
 - c. Hardness: 0 to 10 points.
 5. Oil Swell, 70 hrs @ 104 degrees F: 45%.
 6. Ozone Resistance: No cracks.
- C. Adhesive: elastomeric seal shall be installed utilizing a two-component epoxy based adhesive which meets the following requirements:
1. Tensile Strength: 4,000 psi.
 2. Compressive Strength: 8,000 psi.
 3. Solids hardness: 5 mohs.
 4. Pot life: 40 minutes at 68 degrees F.
 5. Flash Point: Greater than 200 degrees F.
 6. Initial Cure: 24 hours.
 7. Fill Cure: 7 days at 68 degrees F.
- D. For use at expansion joints larger than 1-inch where called for on Drawings as "Neoprene Rubber Seal".

2.08 RELATED MATERIALS

- A. Primer: Nonstaining type, recommended by sealant manufacturer to suit application.
- B. Joint cleaner: Noncorrosive, nonstaining, compatible with joint forming materials and as recommended by sealant manufacturer.
- C. Bond breaker tape: Pressure-sensitive tape recommended by sealant manufacturer to suit application.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate surfaces and joint openings are ready to receive work.
- B. Verify that joint backing and release tapes are compatible with sealant.
- C. Beginning of installation means installer accepts existing conditions

3.02 PREPARATION

- A. Remove loose materials and foreign matter which might impair adhesion of sealant.
- B. Clean and prime joints in accordance with manufacturer's instructions.
- C. Perform preparation in accordance with manufacturer's instructions and in accordance with ASTM C804 for sealant release and ASTM C790 for latex base sealants.
- D. Protect elements surrounding the work of this section from damage or disfiguration.

3.03 INSTALLATION

- A. Measure joint dimensions and size materials to achieve required 2:1 width/depth ratios.
- B. Install open or closed cell backer rod material as recommended by the sealant manufacturer for the specific application undertaken for the sealant relative to its adhesion surfaces.
- C. Perform installation in accordance with ASTM C804 for solvent release and ASTM C790 for latex base sealants.
- D. Install joint backing to achieve a neck dimension no greater than 1/3 of the joint width.
- E. Install bond breaker where joint bkg. is not used.
- F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
- G. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- H. Tool joints to form smooth, straight, uniform beads with slightly concave surfaces.
- I. Install sealant in accordance with manufacturer's instructions.

3.04 CLEANING

- A. Clean surfaces adjacent to sealant as work progresses.
- B. Remove excess uncured sealant by soaking and scrubbing with sealant cleaning solvent.
- C. Remove excess cured sealant by sanding with Number 80 grit sandpaper.
- D. Leave finished work in neat, clean condition.

3.05 CORRECTIONS

- A. Cracking or loss of bond in caulked joints is an indication of incorrectly applied sealants. Cracked and debonded caulks and bond breaker shall be entirely removed, depth of backer rod shall be confirmed and corrected if necessary and sealant re-applied.

3.06 PROTECTION OF FINISHED WORK

- A. Protect sealants until cured.

3.07 SCHEDULE

- A. This Schedule indicates only some of the major items requiring sealant, and is not intended to be all inclusive.

	Location	Type	Color
A.	Window perimeter (Exterior & unconditioned interior areas)	A	Match masonry grout at locations adjacent to masonry Match steel trim color at locations adjacent to steel
B.	Door Frame/Walls (Exterior & unconditioned interior areas)	A	Match masonry grout at locations adjacent to masonry Match steel trim color at locations adjacent to steel
C.	Door Frame/Walls (Interior)	B	White (paintable) adjacent to gyp bd
D.	Window Frame/Walls (Interior)	B	White (paintable) adjacent to gyp bd
E.	Under Thresholds	B	Black
F.	Concrete Joints	A	Grey (SL Horizontal; NS Vertical)
G.	Gypsum System	B	White (paintable)
H.	Masonry Control Joints	A	Match wall color (paintable)
I.	Masonry Expansion Joints	A	Match wall color (paintable)

END OF SECTION

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SECTION 08110

STEEL DOORS AND FRAMES

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Steel Non-Fire Resistive Rated:
 - 1. Doors.
 - 2. Door frames.
 - 3. Window frames.
 - 4. Combination door frames and window frames with mullions, muntins, and transom bars.

1.02 REFERENCES

- 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. American National Standards Institute (ANSI):
 - 1. A250.6 - Hardware on Steel Doors (Reinforcement Application).
 - 2. A250.8 - Recommended Specification for Standard Steel Doors and Frames.
- C. American Society for Testing and Materials (ASTM):
 - 1. A 366 - Standard Specification for Steel, Sheet, Carbon, Cold-Rolled Commercial Quality.
 - 2. A 569 Standard Specification for Steel, Carbon (0.5 Maximum Percent), Hot-Rolled Sheet and Strip, Commercial Quality.
 - 3. A 653/A653M - Standard Specification for Sheet Steel, Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 4. A 924/A924M - Standard Specification for General Requirements for Steel Sheet, Metallic- Coated by the Hot-Dip Process.
 - 5. E 413 - Classification for Rating Sound Insulation.
 - 6. E 1408 - Standard Test Method for Laboratory Measurement of the Sound Transmission Loss of Door Panels and Door Systems.
- D. National Association of Architectural Metal Manufacturers (NAAMM)/Hollow Metal Manufacturers Association (HMMA):
 - 1. HMMA 861 - Guide Specifications For Commercial Hollow Metal Doors and Frames.
- E. Steel Door Institute (SDI):
 - 1. SDI-111 - A Steel Doors and Frame Details.
 - 2. SDI-117 - Manufacturing Tolerances Standard Steel Doors and Frames.
- F. Hollow Metal Manufacturers Association:
 - 1. HMMA 810 - Hollow Metal Doors.

1.03 SUBMITTALS

- A. Product Data.
- B. Shop Drawings: Show the following with references to the Engineer's door marks and hardware groups:
 - 1. Location of door and frame types.
 - 2. Details of fabrication, including core construction, glass lights, louvers, weatherstripping, and factory finish for each door.
 - 3. Cut-outs and reinforcements for hardware.
 - 4. Methods of installation and anchorage to adjacent construction.
- C. Certificates Documenting:
 - 1. Manufacturer's Instructions: Submit manufacturer's installation instructions.

1.04 SUSTAINABLE DESIGN SUBMITTALS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
 - 1. Materials Resources Certificates:
 - a. Certify recycled material content for recycled content products.

1.05 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Approved by ultimate enforcing authority for the Project; regularly engaged in inspection of materials and workmanship at factory.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Before delivery, identify type and size of each door and frame in such a way that markings will not damage finish.
- B. Preassemble doorframes in shop and deliver to Project site with spreader bar at sill or tie them in pairs to form box.
- C. Protect doors and frames with resilient packaging sealed with heat shrunk plastic. Break seal on-site to permit ventilation.
- D. Protect doors and frames during shipment and storage to prevent warping, bending, and corrosion.

1.07 PROJECT CONDITIONS

- A. Sequencing and Scheduling:
 - 1. Ensure timely delivery of reviewed hardware schedule and hardware templates such that no delay occurs in the work of the Contract.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Sheet Steel: ASTM A 366, commercial quality, level, cold rolled steel, or ASTM A 569, hot rolled, pickled and oil rolled steel. Galvanize by hot-dip process with zinc-coating conforming to ASTM A 653 and A 924, with a coating weight of not less than 0.60 ounces per square foot (0.30 ounces per square foot per side). Clips, Bolts, Screws, and Rivets: Sized as recommended by manufacturer.
- B. Primer: Rust- inhibitive metal primer capable of being baked and compatible with finish painting system specified in Section 09902 - Painting.
- C. Touch-Up Materials: Primer as recommended by manufacturer.
- D. Door Hardware: As specified in Section 08710 - Door Hardware.
- E. Grout: As specified in Section 03600 - Grouting.
- F. Glass and Glazing Materials: As specified in Section 08800 - Glazing.
- G. Bituminous Coating: Non-asbestos fibered asphalt emulsion.

2.02 SUSTAINABILITY CHARACTERISTICS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design compliance.
- B. Materials and Resources Characteristics:
 - 1. Recycled Content Materials: Furnish materials with maximum available recycled content.

2.03 DOOR AND FRAME TYPES

- A. Interior Doors: ANSI 250.8, Grade III, Model 3 or NAAMM HMMA 810 Type A and NAAMM HMMA 861, flush steel rib-stiffened, minimum 18 gauge face sheets.
- B. Exterior Doors: ANSI 250.8, Grade III, Model 3, or NAAMM HMMA 810 Type A and NAAMM HMMA 861, flush steel rib-stiffened, minimum 16 gauge face sheets.
- C. Interior Frames: ANSI 250.8 or NAAMM HMMA 861, fully welded frames, minimum 16 gauge, sizes and shapes as indicated on the Drawings.
- D. Exterior Frames: ANSI 250.8 or NAAMM HMMA 861, fully welded frames HMMA 861, except minimum 14 gauge sizes and shapes as indicated on the Drawings.
- E. Sound-Rated (Acoustical) Assemblies: Provide door and frame assemblies fabricated as sound-reducing type, tested in accordance with ASTM E 90, and classified in accordance with ASTM E 413:
 - 1. Unless otherwise indicated, where sound-rated doors are scheduled, provide acoustical assemblies with sound ratings of Sound Transmission Class (from ASTM E 413) (STC) 33 or better.

2.04 COMPONENTS

- A. Door Cores:
 - 1. Stiffeners: Vertical steel ribs formed from minimum 22-gauge plain sheet steel, spaced at maximum 6 inches apart and securely attached to face sheets by spot welds at maximum 5 inches on center.
 - 2. Core Fillers: Insulation, minimum 0.60 pound density noncombustible type, installed in spaces between stiffeners for full height of door; labeled door core material shall conform to requirements of labeling authority.
- B. Glazing Stops: Minimum 18 gauge sheet steel, mitered, square or rectangular:
 - 1. Outside of Exterior Doors: Fixed, integral to doors and frames.
 - 2. Secure Side of Interior Doors: Removable.
- C. Removable Stop Fasteners: Flat head, countersunk, tamperproof, self-tapping sheet metal screws.

2.05 FABRICATION OF FRAMES

- A. Galvanize all frames installed in exterior openings.
- B. Frames: Sheet steel, integral type, welded continuous to full depth of frames with minimum 5/8-inch deep stops, unless otherwise indicated on the Drawings.
- C. Hardware Reinforcement: Minimum 7 gauge at hinges; 12 gauge at strikes, bolts, closers, and other applied hardware.
- D. Jamb Anchors: As required for adjacent wall construction, minimum 3 per jamb, unless otherwise indicated on the Drawings.
- E. Floor Anchors: Fixed type, except where adjustable anchors are indicated on the Drawings, 1 per jamb, with minimum 2 holes for anchorage. Where floor fill occurs, terminate bottom of frames at indicated finished floor level and support by adjustable extension clips resting on and anchored to structural slabs.
- F. Anchors at Masonry: Adjustable strap and stirrup, minimum 16 gauge corrugated or perforated steel at maximum of 30 inches on center and extending minimum 8 inches into masonry.
- G. Anchors at Previously Placed Concrete: Countersink machine screws through the frame into expansion devices spaced at maximum 30 inches on center.
- H. Anchors at Structural Steel Framing: Welded or otherwise securely fastened with stainless steel screws.
- I. Masonry Angle Stiffeners: Factory welded into heads of frames for installation in openings more than 48 inches wide.
- J. Mullions, Muntins, and Transom Bars: Minimum 18 gauge, tubular sheet steel matching, and butt-welded to, head and jamb members.
- K. Removable Stops: Fasten at approximately 12 to 16 inches on center.

- L. Shop Finishing:
 - 1. Steel Sheet: Galvanized to ASTM A653/A653M A60.
 - 2. Primer: Baked.
 - 3. Factory Finish: Baked prime paint over phosphatized steel.
 - 4. Coat inside of frame profile at exterior doors with bituminous coating to minimum thickness of 1/16 inch

2.06 FABRICATION OF DOORS

- A. Galvanize all doors installed in exterior openings.
- B. Reinforce face sheets with steel rib stiffeners, spaced at maximum 6 inches apart, and securely attached to face sheets by spot welds at maximum 5 inches on center.
- C. Fill voids between face sheets and stiffeners with fiberglass insulation having a minimum density of 0.8 pounds per cubic foot.
- D. Edges: Full weld without visible joints. Bevel striking edge 1/8 inch in 2 inches.
- E. Tops and Bottoms of Doors: Close with continuous recess steel channel of minimum 16 gauge, extending full width of door and spot welded to both faces.
- F. Tops and Bottoms of Exterior Doors: Flush closing channels welded to make tops and bottoms waterproof with weep holes for escape of moisture.
- G. Hinge Reinforcement: 7 gauge.
- H. Lock, Closer, and Flush Bolt Reinforcement: 12 gauge.
- I. Astragals:
 - 1. Install on active leaf of double doors.
 - 2. Do not provide astragal cutouts for hardware operations.
- J. Astragal Clearances Doors:
 - 1. Door bottoms at threshold: Not to exceed 3/8 inch between threshold and door bottom.
 - 2. Door bottoms where there is no threshold: Maximum clearance between door and floor not to exceed 1/2 inch.
 - 3. Door bottoms at doors designated to receive floor coverings: Not to exceed 1/2 inch between floor covering and door bottom.
 - 4. Clearance between door and frame and between meeting edges of pairs of doors: Not to exceed 1/8 inch.
- K. Glazing: Insulated at all exterior doors. Insulated at interior doors where door separates conditioned and unconditioned space.

2.07 HARDWARE PREPARATION

- A. Cut-out, drill, and reinforce frames and doors for hardware in accordance with hardware templates.
- B. Install plaster guards or mortar boxes in back of hardware cut-outs in and welded to frames.

- C. Do not weld hinges to doorframes.
- D. Silencers:
 - 1. Drill single leaf doorframe jamb stops for minimum 3 silencers.
 - 2. Drill double-leaf doorframe head stops for minimum 2 silencers.
 - 3. Do not drill doorframes for silencers when weatherstripping is to be installed.

2.08 FINISHING

- A. Thoroughly clean surfaces of oil, grease, and other impurities; touch-up abraded galvanizing; and chemically etch.
- B. Fill irregularities and sand smooth finish surface. Apply 1 coat of manufacturer's standard rust inhibitive baked-on primer.
- C. Finish Painting: As specified in Section 09902 - Painting.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine reviewed hardware schedules and verify proper coordination of hardware and doors and frames.
- B. Examine opening locations and verify the following:
 - 1. Correctness of dimensions, backing or support conditions.
 - 2. Absence of defects that would adversely affect frame or door installation.

3.02 INSTALLATION

- A. Install doors and frames in accordance with approved shop drawings and manufacturer's instructions.
- B. Frames:
 - 1. Set accurately in position, plumb, align, and attach securely to structure.
 - 2. Set in place before construction of adjacent masonry or framed walls.
 - 3. Anchor frames to previously placed concrete.
 - 4. Set frames before removing spreader bars.
 - 5. Fully grout frames in masonry as the Work progresses.
 - 6. Grout frames at concrete through keyways provided at head and jambs.
- C. Doors: Install at correct openings, ensure smooth swing and proper closure with frame.
- D. Door Hardware: Install in accordance with Section 08710 – Door Hardware.
- E. Separate or isolate dissimilar metals with neoprene gaskets, sleeves, and washers, or with coatings acceptable to the Engineer.

3.03 TOLERANCES

- A. Manufacturing and Installation Tolerances: As indicated on the Drawings or in conformance to SDI 117 as minimum.

3.04 ADJUSTING AND CLEANING

- A. Prime Coat Touch-Up: Immediately after installation, sand smooth and touch-up rust areas and other areas where primer has been damaged, with prime touch-up paint.
- B. Make adjustments as required for correct, proper, and free function and smooth operation without binding of hardware or doors and frames.
- C. Protect doors and frames from damage to surface or profile.

END OF SECTION

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SECTION 08210

WOOD DOORS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. 5 ply interior flush wood veneer doors.
 - 2. Flush and flush glazed configuration.
 - 3. Non-rated doors.

1.02 REFERENCES

- 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. ANSI:
 - 1. ANSI/HPMA HP - Hardwood and Decorative Plywood.
 - 2. ANSI A208.1 Particleboard.
 - 3. ANSI A135.4 - Basic Hardboard.
 - 4. ANSI/NWWDA I.S. 1-87 - Flush Wood Door Quality Standards.
- C. ASTM E413 - Classification for Determination of Sound Transmission Class.
- D. WDMA Finish System TR-6, transparent catalyzed polyurethane.
- E. AWI - Quality Standards of the Architectural Woodwork Institute.
- F. FSC Guidelines - Forest Stewardship Council Guidelines.

1.03 SUBMITTALS

- A. Submit under provisions of Section 01300 - Submittals.
- B. Shop Drawings: Illustrate door opening criteria, elevations, sizes, types, swings, undercuts required, special beveling, special blocking for hardware, identify cutouts for glazing.
- C. Product Data: Indicate door core materials and construction; Plastic laminate type and factory machining criteria.
- D. Samples: Submit two chains of stained finish selections. Include all wood grain, stain color and sheen color options.

1.04 SUSTAINABLE DESIGN SUBMITTALS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design submittals.

- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
 - 1. Materials Resources Certificates:
 - a. Certify recycled material content for recycled content products.
 - b. Certify lumber is harvested from Forest Stewardship Council Certified well managed forest.
 - 2. Indoor Air Quality Certificates:
 - a. Certify each composite wood product contains no added urea-formaldehyde resins

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with AWI Quality Standard Section 1300, Premium Grade.
- B. Finish doors in accordance with AWI Quality Standard Section 1500, grades identified in section.
- C. Maintain one copy of each document on site.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Section 01600 - Product Requirements.
- B. Package, deliver and store doors in accordance with AWI Section 1300.
- C. Protect doors with resilient packaging sealed with heat shrunk plastic. Do not store in damp or wet areas; or in areas where sunlight might bleach laminate or veneer. Seal top and bottom edges if stored more than one week.
- D. Break seals on-site to permit ventilation.

1.07 PROJECT CONDITIONS

- A. Qualifications:
 - 1. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- B. Field Measurements:
 - 1. Verify that field measurements are as indicated on shop drawings.
- C. Coordination:
 - 1. Coordinate Work with door opening construction, doorframe and door hardware installation.

1.08 WARRANTY

- A. Section 01700 – Contract Closeout: Product warranties and product bonds.
- B. Provide manufacturer's five year warranty for interior doors.

- C. Include coverage for delaminating of veneers, warping beyond specified installation tolerances, defective materials, telegraphing core construction.

PART 2 PRODUCTS

2.01 SUSTAINABILITY CHARACTERISTICS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design compliance.
- B. Materials and Resources Characteristics:
 - 1. Recycled Content Materials: Furnish materials with maximum available recycled content.
 - 2. Certified Wood Materials: Furnish wood materials certified in accordance with FSC Guidelines.
- C. Indoor Environmental Quality Characteristics:
 - 1. Interior Composite Wood Products: Contain no added urea-formaldehyde resins.

2.02 FLUSH WOOD DOORS

- A. Manufacturers: One of the following or approved equal:
 - 1. Eggers Industries.
 - 2. Graham Doors.
 - 3. Marshfield DoorSystems.
 - 4. VT Industries

2.03 PRODUCT DESCRIPTION

- A. Solid core flush wood doors; wood veneer facing material; flush design; shop finished.
 - 1. Interior Flat and Non-Flat Paints: Maximum volatile organic compound content in accordance with GS-11.
 - 2. Flush Interior Doors: 1-3/4 inches thick; solid core, five-ply construction as indicated on Drawings.
 - a. Furnish wood materials certified in accordance with FSC Guidelines.

2.04 COMPONENTS

- A. Particle Board Core: Mat formed particle board conforming to Grade 1-LD-2, Density C, 28 to 32 lbs. per cubic feet.
 - 1. Interior Composite Wood and Agrifiber Products: Contain no added urea-formaldehyde resins.
- B. Mineral Core: Non-combustible 30.8 pcf to 34.7 pcf.
- C. Veneer Plain Sliced Natural Birch, stain color as selected by Architect from full standard line of finishes.
- D. 2 5/8-inch wide hardwood top and bottom rail.

- E. 1 3/4-inch wide one-piece mill option hardwood stile.
- F. Inner stiles for Mineral core doors.
- G. Perimeter edge cants painted to match laminate tone.
- H. Cross Banding: composite cross bands; concealed.
- I. Facing Adhesive: Type I; waterproof.

2.05 ACCESSORIES

- A. Glazing Stops: Rolled steel channel shape, primed, mitered corners, prepared for countersink style tamper proof screw.

2.06 FABRICATION

- A. Fabricate non-fire rated doors in accordance with AWI Quality Standards requirements.
- B. Provide lock blocks at lock edge and top of door for closer for hardware reinforcement.
- C. Vertical Exposed Edge of Stiles: Hardwood stained and lacquered to match wood veneer or laminate facing.
- D. Factory machine doors for finish hardware in accordance with hardware requirements and dimensions. Do not machine for surface hardware. Provide solid blocking for through bolted hardware.
- E. Factory pre-fit doors for frame opening dimensions identified on shop drawings.
- F. Turn all exposed edges of doors to provide a smooth corner edge (nominal 1/8 inch radius).
- G. Provide edge clearances in accordance with AWI 1300.

2.07 SHOP FINISHING

- A. Factory finish doors in accordance with AWI Quality Standards: Premium.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify opening sizes and tolerances are acceptable.
- B. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment

3.02 INSTALLATION

- A. Trim non-rated door width by cutting equally on both jamb edges as authorized by manufacturer and re-finish per manufacturer standards.
- B. Trim door height by cutting bottom edges to a maximum of 1/8 inch.
- C. Pilot drill screw and bolt holes.
- D. Machine cut doors for hardware installation. Core for handsets and cylinders.
- E. Coordinate installation of doors with installation of frames specified in Section 08110 and hardware specified in Section 08710.
- F. Coordinate installation of glass and glazing specified in Section 08800.

3.03 INSTALLATION TOLERANCES

- A. Conform to AWI requirements for fit and clearance tolerances.
- B. Maximum Diagonal Distortion (Warp): 1/8 inch measured with straight edge or taught top to bottom string, corner to corner, over an imaginary 36 by 84-inch surface area.
- C. Maximum Vertical Distortion (Bow): 1/8 inch measured with straight edge or taught string, top to bottom, over an imaginary 36 by 84-inch surface area.
- D. Maximum Width Distortion (Cup): 1/8 measured with straight edge or taught string, edge to edge, over an imaginary 36 by 84-inch surface area.

3.04 ADJUSTING

- A. Adjust door for smooth and balanced door movement.
- B. Adjust closer for full closure.

3.05 SCHEDULE

- A. Refer to Door and Frame Schedule in the Contract Drawings.

END OF SECTION

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SECTION 08330

ARCHITECTURAL OVERHEAD COILING DOOR

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Overhead coiling doors.
 - 2. Operating hardware.
 - 3. Manual operation.

1.02 RELATED REQUIREMENTS

- A. Related sections:
 - 1. Section 04229 – Concrete Masonry Units: Support masonry and masonry opening.
 - 2. Section 07900 – Joint Sealers: Sealants and backing materials.
 - 3. Section 08710 – Door Hardware: Product requirements for cylinder core and keys for placement by this section.
 - 4. Section 09902 – Painting & Protective Coatings: Field paint finishes.
 - 5. Section 13122 – Metal Building System: Support framing and framed opening.

1.03 REFERENCES

- 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:
 - 1. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 2. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
 - 3. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 4. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
- C. Intertek Testing Services (Warnock Hersey Listed):
 - 1. WH - Certification Listings.
- D. UL:
 - 1. UL - Building Materials Directory.
 - 2. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems.
 - 3. UL 1784 - Standard for Air Leakage Tests of Door Assemblies and Other Opening Protectives.

1.04 SUBMITTALS

- A. Section 01300 - Submittals: Requirements for submittals.
- B. Product Data: Submit general construction details, component connections.
- C. Shop Drawings: Indicate relevant dimensioning, anchorage methods, hardware locations, and installation details for applicable supporting wall construction.
- D. Samples: Submit two slats, 12 by 12 inches in size, illustrating shape, color, and finish texture.
- E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- F. Manufacturer Instructions: Submit installation sequence and procedures, and adjustment and alignment procedures.

1.05 SUSTAINABLE DESIGN SUBMITTALS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate:
 - 1. Certify products meet or exceed specified sustainable design requirements.
 - 2. Materials Resources Certificates:
 - a. Certify recycled material content for recycled content products.

1.06 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Approved by ultimate enforcing authority for the Project; regularly engaged in inspection of materials and workmanship at factory.
- B. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years' experience.
- C. Installer: Company specializing in performing Work of this Section with minimum three years' experience and approved by manufacturer.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Section 01600 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- C. Store materials according to manufacturer instructions.
- D. Protection:
 - 1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
 - 2. Provide additional protection according to manufacturer instructions.

1.08 PROJECT CONDITIONS

- A. Sequencing and Scheduling:
 - 1. Ensure timely delivery of reviewed hardware schedule and hardware templates such that no delay occurs in the work of the Contract.
- B. Field Measurements:
 - 1. Verify field measurements prior to fabrication.
 - 2. Indicate field measurements on Shop Drawings.

1.09 WARRANTY

- A. Section 01700 - Contract Closeout: Requirements for warranties.
- B. Furnish one-year manufacturer's warranty for overhead coiling doors and a thirty-year warranty covering the finish.

PART 2 PRODUCTS

2.01 OVERHEAD COILING DOORS

- A. Manufacturers:
 - 1. DBCI, Douglasville, GA.
 - 2. Or approved equal.

2.02 SUSTAINABILITY CHARACTERISTICS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design compliance.
- B. Materials and Resources Characteristics:
 - 1. Recycled Content Materials: Furnish materials with maximum available recycled content.

2.03 DESCRIPTION

- A. Manual Operation:
 - 1. Operator: Hand-chain lift, with overhead counterbalance device.
 - 2. Nominal Required Force: 25 lbf (110 N).
- B. Curtain:
 - 1. 26-gauge galvanized corrugated steel.
 - 2. Insulated, R-4.
 - 3. Draft stops to prevent air and moisture infiltration.
 - 4. Aluminum bottom bar fitted with aluminum angles, channels, or hollow extrusion to provide reinforcement and to maintain positive contact with floor in closed position with stainless steel fasteners.
- C. Guides:
 - 1. Description:
 - a. Rolled galvanized steel track.
 - b. Configuration: Continuous.

2. Minimum Thickness: 0.0747 inch (1.897 mm).
 3. Mounting:
 - a. Orientation: Vertical.
 - b. Brackets: Galvanized steel.
- D. Roller Shaft Counterbalance:
1. Description:
 - a. 11 gauge steel pipe capable of supporting curtain load with maximum deflection of 0.03 in./ft. (2.5 mm/m) of width.
 - b. Steel spring system capable of producing torque sufficient to ensure smooth operation of curtain from any position, and capable of holding position at mid-travel.
- E. Hardware:
1. Locks: As specified in Section 08710 - Door Hardware.

2.04 COMPONENTS

- A. Overhead coiling doors:
1. Basis of Design: DBCI 3250 Series.

2.05 FINISHING

- A. Precoated Paint Finish:
1. Type: Manufacturer's standard.
 2. Color: As selected.

2.06 ACCESSORIES

- A. Chain Keeper: Manufacturer's standard.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Section 01700 - Contract Closeout: Requirements for installation examination.
- B. Verify that opening sizes, tolerances, and conditions are acceptable.
- C. Verify that supplementary support framing installed under other Sections is ready to receive doors..

3.02 INSTALLATION

- A. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress .
- B. Securement:
1. Securely and rigidly brace components suspended from structure.
 2. Secure guides to structural members only.

- C. Fit and align assembly, including hardware, level and plumb to provide smooth operation.
- D. Sealants and Backing Materials: As specified in Section 07900 - Joint Sealants.
- E. Separate or isolate dissimilar metals with neoprene gaskets, sleeves, and washers, or with coatings acceptable to the ENGINEER.
- F. Install perimeter trim and closures.

3.03 TOLERANCES

- A. Section 01400 - Quality Control Services: Requirements for tolerances.
- B. Maintain dimensional tolerances and alignment with adjacent Work.
- C. Maximum Variation from Plumb: 1/16 inch.
- D. Maximum Variation from Level: 1/16 inch.
- E. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 feet straight edge.

3.04 ADJUSTING AND CLEANING

- A. Section 01700 - Contract Closeout: Requirements for testing, adjusting, and balancing and cleaning.
- B. Testing:
 - 1. Test for proper operation.
- C. Adjust door, hardware, and operating assemblies for smooth and noiseless operation.
- D. Clean door and components.
- E. Remove labels and visible markings.

END OF SECTION

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SECTION 08332

MOTORIZED OVERHEAD COILING DOOR

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Non-fire rated insulated overhead coiling doors.

1.02 REFERENCES

- A. National Electrical Manufacturers Association (NEMA):
 - 1. 250 - Enclosures for Electrical Equipment (1000 V Maximum).
- B. ASTM International:
 - 1. A123 - Standard specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - 2. A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
 - 3. A666 - Standard specification for Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
 - 4. A924 - Standard Specification for General Requirements of Steel Sheet, Metallic-Coated by the Hot-Dip Process (Referenced by ASTM A653).

1.03 DEFINITIONS

- A. NEMA:
 - 1. Type 4X enclosure in accordance with NEMA 250.
 - 2. Type 12 enclosure in accordance with NEMA 250.

1.04 SUBMITTALS

- A. Product data:
 - 1. General: Submit data completely describing products, including rough-in diagrams.
 - 2. Electrical operators: Submit complete manufacturer's data for all components for electric door operators. Show motor size and characteristics. Show manufacturer's verification that motor has been adequately sized for each size and type of door required. Submit electrical schematic diagrams.
- B. Shop drawings:
 - 1. Drawings showing complete installation details, required clearances, relation to building structure, complete electrical rough-in requirements required for installation of motor operators for doors and for connection of such doors to fire alarm system, referenced to the door mark number.
 - 2. Show location and size of access doors required to perform maintenance on doors and auxiliary equipment.
- C. Samples: Submit samples of finishes for finish selection.

- D. Quality control submittals:
 - 1. Manufacturer's instructions:
 - a. Installation instructions for each type and size of door, including manufacturer's data, operating instructions, and maintenance data.
 - b. Furnish installer copy of diagrams and installation instructions.
- E. Contract closeout submittals:
 - 1. Project record documents:
 - a. Operation and maintenance data: Provide manufacturer's operation and maintenance data for each different type of door specified, complete with manufacturer's list of recommended spare parts and their prices, electrical schematic diagrams, and name and address of nearest maintenance organization approved by door manufacturer.
 - b. Warranty: Provide manufacturer's standard warranty.

1.05 QUALITY ASSURANCE

- A. Regulatory requirements:
 - 1. Wind loading as specified in Section 01614 - Wind Design Criteria.
 - 2. Seismic requirements for door anchorage and support systems as specified in Section 01612 - Seismic Design Criteria.
 - 3. Provide electrical materials in NEMA Type enclosures as specified.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Packing, shipping, and storage: Protect doors during shipment and storage to prevent warping, bending, and corrosion.
- B. Deliver materials only after proper facilities are available: Provide clean dry surfaces or platform as required and protect from deterioration and foreign matter.

1.07 PROJECT CONDITIONS

- A. Field measurements: Field verify all opening dimensions and clearances prior to fabricating doors. Fitting doors to openings is the responsibility of the Contractor.

1.08 SEQUENCING AND SCHEDULING

- A. Inserts and anchorages: Furnish inserts and anchoring devices which must be set into concrete or built into masonry. Provide setting drawings, templates, and directions for installation of anchorage devices. Coordinate delivery with other work to avoid delay to the Contract.

PART 2 PRODUCTS

2.01 DESIGN AND PERFORMANCE CRITERIA

- A. Design requirements:
 - 1. Compatibility with space and service requirements:
 - a. Doors and equipment items provided shall be compatible with space limitations specified and indicated on the Drawings.

- b. Make modifications to doors and equipment items necessary to conform with space limitations or with utility services specified for rough-in.
 - c. Provide items complete including all necessary ancillary equipment as may be required for complete and trouble-free operation.
2. Maintenance requirements: For ease of maintenance, provide overhead coiling doors complying with following requirements:
- a. Provide each door assembly as complete unit produced or supplied by a single manufacturer, including frames, sections, brackets, operating mechanisms, hardware, except hardware items specified in Section 08710 - Door Hardware, and all necessary accessories for installation of complete in openings indicated.
 - b. Unless otherwise specified, all doors of particular type throughout the entire project shall be as manufactured or supplied by a single manufacturer.

2.02 MANUFACTURED UNITS

- A. Manufacturers: One of the following or equal:
- 1. Overhead Door Corp.
 - 2. Wayne-Dalton Corp.
 - 3. The Cookson Co., Inc.
- B. Steel overhead coiling door:
- 1. Mounting: Face of wall.
 - 2. Operation: As indicated on the Drawings.
 - 3. Curtain:
 - a. Exterior slats: Manufacturer's standard, minimum 20-gauge steel galvanized in accordance with ASTM A653, interlocking flat-faced slats with ends of alternate slats fitted with metal end locks to hold curtain in alignment.
 - b. Bottom bar: Steel galvanized in accordance with ASTM A123, fitted with 2 equal-sized steel angles minimum 1/8-inch thick, with lift handle and slide bolt at either end and provided with a flexible PVC bulb type astragal to ensure a consistent seal along the floor. Extrusion designed to interlock with door curtain.
 - c. Weatherstripping:
 - 1) Bottom bar: Manufacturer's standard, provided with a flexible PVC bulb type astragal to ensure a consistent seal along the floor. Extrusion designed to interlock with door curtain.
 - 2) Door jambs: Manufacturer's standard vinyl extrusion seals, manufacturer's standard.
 - 3) Hood: Manufacturer's standard vinyl air baffle.
 - 4. Guides: Steel galvanized in accordance with ASTM A123, formed of roll formed steel channels and angles or structural angles of sufficient depth to provide a groove of adequate depth on each jamb to hold curtain firmly in guides under design wind pressure.
 - 5. Brackets: Steel galvanized in accordance with ASTM A123, steel plate with permanently sealed ball bearings designed to enclose ends of coil and provide support for counterbalance pipe at each end.

6. Barrel and counterbalance mechanism: Steel pipe of sufficient size to carry door load with maximum deflection of 0.03 inch per foot of opening width and counterbalanced by helical springs, oil tempered torsion type designed with minimum safety factor of 1.25 percent, and having cast iron barrel plugs that anchor springs to tension shaft and pipe.
 7. Hood: Manufacturer's standard, minimum 24-gauge steel galvanized in accordance with ASTM A653, designed to enclose curtain coil and counterbalance mechanism.
- C. Insulation:
1. Interior slats: Material to match exterior slats as specified in previous article, interlocking flat-faced slats, manufacturer's standard size with ends of alternate slats fitted with metal end locks to hold curtain in alignment.
 2. Insulation: CFC-free Polyethylene foam yielding a minimum R-value of 6.20.
- D. Door operators:
1. Chain operator: Unless otherwise indicated on the Drawings, use at doors 56 square feet or larger in area. Provide a continuous hand chain and gearing on coil side of door.
 2. Motor operator: Unless otherwise indicated on the Drawings, provide a heavy-duty type motor operator rated for the environment encountered at a wastewater treatment plant.
 - a. High starting torque type motor having sufficient power to operate the load at an average speed of 1 foot per second.
 - b. Totally enclosed, fan cooled, continuous-duty motor, sized to suit door size (1 horsepower minimum), with Class B insulation.
 - c. 480 volt, 3-phase operation.
 - d. Controlled by momentary contact 3-button station marked OPEN, CLOSE, and STOP. As indicated on the Drawings.
 - e. Provide automatic screw-type limit switch to break circuit at termination of travel.
 - f. Provide gear reducer consisting of high efficiency worm gearing running in an oil bath and a spring set, solenoid-operated brake designed to hold the load when power is off.
 - g. Provide emergency hand chain operator which does not affect the time of the limit switch, to operate the load in case of power failure.
 - h. Operator to have reversing NEMA Size 1 starter having mechanical and electrical interlocks, properly sized 24-volt control transformer, and other controls necessary for proper operation, completely assembled and wired to a terminal strip to facilitate field wiring of the power source, pushbutton stations, and/or other remote devices.
 - i. Unless otherwise indicated on the Drawings, all electrical material supplied shall be in NEMA Type 12 enclosures for installation at the Administration Building and in NEMA Type 4X enclosures for installation at the Headworks Building.
 - j. Provide electronic safety edge to reverse direction of door if obstruction is encountered.
 - k. Where no safety edge is specified, 2-button constant pressure type pushbutton stations marked OPEN and CLOSE shall be provided in lieu of 3-button station previously indicated.

2.03 ACCESSORIES

- A. Fasteners: Sizes and types as recommend by reviewed door manufacturer.

2.04 FINISHES

- A. Slats, hood and bottom bar:
 - 1. Galvanized steel: Manufacturer's standard rust inhibitive prime coat and with powder coat finish as selected by Owner from manufacturer's standard colors.
- B. Guides and bracket plates:
 - 1. Galvanized steel: manufacturer's standard rust inhibitive prime coat in a flat black finish.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of conditions: Examine openings to receive overhead coiling doors and verify:
 - 1. Dimensions and correctness of backing or support conditions.
 - 2. Absence of defects that would adversely affect installation.
- B. Do not start the work until unsatisfactory conditions are corrected.

3.02 PREPARATION

- A. Verify dimensions and design for each opening.
- B. Coordinate details with other work supporting or adjoining coiling doors.
- C. Furnish fastening devices as required to mount doors properly.

3.03 INSTALLATION

- A. Install doors in strict accordance with manufacturer's installation instructions, unless specifically otherwise indicated on the Drawings.
- B. Install assemblies plumb, square, and level at their proper elevations and in their proper planes.
- C. Securely anchor assemblies to interior face of openings, in manner that provides full opening clearance, perfectly aligned and adjusted for smooth operation.
- D. Interface with other products: Separate or isolate dissimilar metals with neoprene gaskets, sleeves, or washers, or with an acceptable coating.

3.04 ADJUSTING

- A. Verify that door assemblies are securely anchored to structure, guides are perfectly aligned, and doors are adjusted for smooth operation.

- B. Upon completion of installation, ensure doors are free from warp, twist, or distortion and are lubricated and properly adjusted to operate freely.

3.05 CLEANING

- A. Thoroughly clean surfaces of grease, oil, and other impurities.
- B. Replace any damaged or otherwise disfigured doors with new prior to final acceptance.

3.06 DEMONSTRATION

- A. Provide Owner's maintenance employees with minimum of 8 hours of maintenance instruction.

3.07 PROTECTION

- A. Protect installed doors from damage until final acceptance.

END OF SECTION

SECTION 08410

METAL FRAMED STOREFRONT

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Aluminum storefront doors and windows with insulated glass at exterior locations.
 - 2. Aluminum Entrance Doors.
 - 3. Hardware and Accessories
- B. Products Installed but Not Furnished Under This Section:
 - 1. Section 08800 – Glazing.

1.02 REFERENCES

- 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. American Architectural Manufacturers Association
 - 1. Metal Curtain Wall, Window, Store Front and Entrance – Guide Specifications Manual.
 - 2. Curtain Wall Manual #10 – Care and Handling of Architectural Aluminum From Shop to Site.
 - 3. 501 – Methods of Test for Metal Curtain Walls.
 - 4. 605.2 – Specification for High Performance Organic Coatings on Architectural Extrusions and Panels.
 - 5. SFM-1 – Aluminum Storefront and Entrance Manual.
- C. ANSI /ASTM
 - 1. ANSI A117.1 – Safety Standards for the Handicapped.
 - 2. ANSI/ASTM A36 – Structural Steel.
 - 3. ANSI/ASTM A386 – Zinc Coating (Hot Dip) on Assembled Steel Products.
 - 4. ANSI/ASTM A446 – Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality.
 - 5. ANSI/ASTM B209 – Aluminum and Aluminum-Alloy Sheet and Plate.
 - 6. ANSI/ASTM B221 – Aluminum-Alloy Extruded Bar, Rod, Wire, Shape, and Tube.
 - 7. ANSI/ASTM E283 – Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors.
 - 8. ANSI/ASTM E330 – Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
 - 9. ANSI/ASTM E331 – Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
- D. SSPC – Steel Structures Painting Council.

1.03 SUBMITTALS

- A. Submit under provisions of Section 01300 - Submittals.
- B. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related Work and expansion and contraction joint location and details.
- C. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, internal drainage details and hardware reinforcement.
- D. Submit two samples 12-by-12 inches in size illustrating pre-finished aluminum surface, glass, infill panels, glazing materials.
- E. Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.

1.04 SUSTAINABLE DESIGN SUBMITTALS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate:
 - 1. Certify that products meet or exceed specified sustainable design requirements.
 - 2. Materials Resources Certificates:
 - a. Certify recycled material content for recycled content products.
 - 3. Indoor Air Quality Certificates: Certify VOC content for each interior adhesive, sealant, and related primer.

1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with AAMA SFM-1 and AAMA – Metal Curtain Wall, Window, Store Front and Entrance – Guide Specifications Manual.
- B. Conform to requirements of ANSI A117.1.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Handle work of this section in accordance with AAMA – Curtain Wall Manual #10.
- B. Protect pre-finished aluminum surfaces with strippable coating. Do not use adhesive papers or sprayed coatings that bond when exposed to sunlight or weather.

1.07 PROJECT CONDITIONS

- A. Qualifications:
 - 1. Manufacturer and Installer: Company specializing in manufacturing aluminum glazing systems with minimum 3 years documented experience.
- B. Pre-Installation Conference:

1. Convene 1 week prior to commencing work of this Section, under provisions of Section 01400 - Quality Control Services.
- C. Environmental Requirements:
 1. Do not install sealants when ambient temperature is less than 40 degrees F during and 48 hours after installation.
- D. Field Measurements:
 1. Verify that field measurements are as indicated on shop drawings.
- E. Coordination:
 1. Coordinate the Work with installation of glazing and hardware installation.

1.08 WARRANTY

- A. Provide 3-year manufacturer's warranty.
- B. Warranty: Include coverage for complete system for failure to meet specified requirements.

PART 2 PRODUCTS

2.01 SUSTAINABILITY CHARACTERISTICS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design compliance.
- B. Materials and Resources Characteristics:
 1. Recycled Content Materials: Furnish materials with maximum available recycled content.
- C. Indoor Environmental Quality Characteristics:
 1. Interior Anticorrosive Paints: Maximum VOC content according to GC-03.

2.02 MANUFACTURERS

- A. Storefronts
 1. Oldcastle BuildingEnvelope, Terrell, Texas.
 2. Kawneer Company, Inc., Norcross, GA.
 3. Efco, Monett, MO.
 4. Or approved equal.

2.03 MATERIALS

- A. Extruded Aluminum: ANSI/ASTM B221; 6063 alloy, T5 temper.
- B. Sheet Aluminum: ANSI/ASTM B209.
- C. Sheet Steel: ANSI/ASTM A446 galvanized.
- D. Steel Sections: ANSI/ASTM A36; shaped to suit mullion sections.

- E. Fasteners: Stainless steel.
- F. Shop and Touch-Up Primer for Steel Components: SSPC 15, Type 1, red oxide.
- G. Touch-Up Primer for Galvanized Steel Surfaces: SSPS 20, zinc rich type.
- H. Glazing Glazing Materials as indicated:
- I. Gaskets for doors and frames shall be EPDM extrusions.
 - 1. Glass and Exterior: 1-inch Insulated pane and sealed.
 - 2. Interior: 1/4-inch monolithic
 - 3. See Section 08800.
- J. Sealant and Backing Materials: As specified in Section 07900 - Joint Sealers.

2.04 COMPONENTS

- A. Storefront and window framing:
 - 1. Basis of Design: Oldcastle BuildingEnvelope Series 3000 Thermal MultiPlane
 - a. Vertical and horizontal framing members shall have a nominal face dimension of 2 inches.
 - b. Overall depth shall be 4-1/2 inches with appropriate glass pocket width for Insulated Glass Units.
- B. Exterior Doors: Wide Stile Standard 5-1/2 inches for insulated glass insert.
- C. Exterior Door Hardware: See Section 08710 – Door Hardware.

2.05 FABRICATION

- A. Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.
- B. Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.
- C. Prepare components to receive anchor devices. Fabricate anchors.
- D. Arrange fasteners and attachments to conceal from view.
- E. Prepare components with internal reinforcement for door hardware and door operator hinge hardware.
- F. Reinforce framing members for imposed loads.

2.06 FINISHES

- A. Exterior and Interior facing components of Aluminum Storefronts, Window Wall and Window assemblies.
- B. Color: Clear Anodic coating electrolytically deposited to Class I, AA-M12C22A44 anodized to 0.7-mil thickness, prepared with a mechanical M12 and Chemical C22 pre-treatment; Clear anodized color.

- C. Concealed Steel Items: Galvanized in accordance with ANSI/ASTM A386 to 2.0 oz/sq feet.
- D. Apply one coat of bituminous paint to concealed aluminum and steel surfaces in contact with cementitious or dissimilar materials.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify dimensions, tolerances, and method of attachment with other work.
- B. Verify wall openings and adjoining air and vapor seal materials are ready to receive work of this Section.

3.02 INSTALLATION

- A. Install wall system in accordance with manufacturer's instructions and AAMA – Metal Curtain Wall, Window, Store Front and Entrance – Guide Specifications Manual.
- B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- C. Provide alignment attachments and shims to permanently fasten system to building structure.
- D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
- E. Provide thermal isolation where components penetrate or disrupt building insulation.
- F. Install sill flashings.
- G. Coordinate attachment and seal of perimeter air and vapor barrier materials.
- H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- I. Install flashings.
- J. Set thresholds in bed of Sealant mastic and secure to waterproof condition.
- K. Install hardware using templates provided.
- L. Install glass in accordance with manufacturer recommended method of glazing.
- M. Install all sealed insulated glass units.
- N. Install perimeter sealant to method required to achieve performance criteria.

3.03 TOLERANCES

- A. Maximum Variation from Plumb: 0.06 inches every 3 feet non-cumulative or 1/16 inches per 10 feet, whichever is less.
- B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.04 FIELD QUALITY CONTROL

- A. Test to ASTM E1105 to determine water penetration of curtain walls and doors.

3.05 ADJUSTING

- A. Adjust work as necessary prior to project closeout.
- B. Adjust operating hardware for smooth operation.

3.06 CLEANING

- A. Clean work under provisions of 01700 - Contract Closeout.
- B. Remove protective material from pre-finished aluminum surfaces.
- C. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.
- D. Remove excess sealant by method acceptable to sealant manufacturer.

3.07 PROTECTION OF FINISHED WORK

- A. Protect finished Work from damage.

END OF SECTION

SECTION 08710

DOOR HARDWARE

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Door hardware.

1.02 REFERENCES

- 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):
 - 1. E 90 – Standard Test Method for Laboratory Measurement of Airborne-Sound Transmission Loss of Building Partitions and Elements.
 - 2. E 283 – Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
- C. Builders Hardware Manufacturers Association (BHMA):
 - 1. A 156.7 – Template Hinge Dimensions.
 - 2. A 156.18 – Hardware – Materials and Finishes.

1.03 DESIGN AND PERFORMANCE CRITERIA

- A. Regulatory Requirements:
 - 1. Provide hardware for fire resistive rated openings that complies with UL and listed by UL.

1.04 SUBMITTALS

- A. Product Data:
 - 1. Provide product data in the form of a binder, manufacturer's technical product fact sheets for each item of hardware. Include whatever information may be necessary to show compliance with requirements, including instructions for installation and for maintenance of operating parts and finish.
- B. Hardware Schedule including the following in vertical format:
 - 1. Heading Number/Hardware Set.
 - 2. Door Number, Location, Hand, Degree of Opening, Door Size and Type, Frame Size and Type, Fire Rating.
 - 3. Quantity, type, style, function, product, product number, size, fasteners, finish and manufacturer of each hardware item.
 - 4. Location of hardware set cross-referenced to indications on Drawings both on floor plans and in door and frame schedule.
 - 5. Keying schedule.
 - 6. Title Sheet, Index, Abbreviations, Manufacturers List, Template List and Templates.

7. Mounting locations for hardware.
 8. Explanation of abbreviations, symbols, and codes contained in schedule.
- C. Samples: Provide samples as requested with Heading Number and Door Number marked on boxes. All samples will be returned to the contractor and used on doors for which they were marked.
- D. Keying Schedule: A keying schedule shall be submitted using keyset symbols referenced in DHI manual "Keying Systems and Nomenclature." The keying schedule shall be indexed by door number, keyset, hardware heading number, cross keying instructions and special key stamping instructions.
- E. Construction Key Distribution List: Submit upon Owner's request.
- F. Templates: Furnish hardware templates to fabricators of doors, frames, and other work to be factory-prepared for hardware. Check shop drawings of other work, to confirm that adequate hardware backing is available.
- G. Operations and maintenance data: At the completion of the job, provide to the Owner two copies of an Owner's operation and maintenance manual. The manual shall consist of a labeled hardcover three ring binder with the following technical information:
1. Title page containing: Project name, address and phone numbers. Supplier's name, address and phone numbers.
 2. Table of Contents.
 3. Copy of final Finish Hardware Schedule and Keying Schedule.
 4. Maintenance instruction for each item of hardware.
 5. Catalog pages for each product.
 6. Installation Instructions and Parts List for all Locks, Exit Devices and Door Closers.
- H. Project Record Documents: Include corrected hardware schedule.

1.05 SUSTAINABLE DESIGN SUBMITTALS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
1. Materials Resources Certificates:
 - a. Certify recycled material content for recycled content products.

1.06 QUALITY ASSURANCE

- A. Substitutions: Request for substitutions shall not be accepted within this project. Architect, Owner, and Hardware Consultant have selected 1 specified and 2 equals listed hereinafter in the Hardware Schedule. By this selection process they have established 3 equal products for competitive pricing, while insuring no unnecessary delays by a substitution process. If any specified product is listed as a "No Substitution" product, this product will be supplied as specified, with no alteration or request of substitution. The reason for this is to comply with the uniformity

established at this project. Parts and supplies are inventoried for these particular products for ease and standardization of replacement.

- B. **Supplier Qualifications:** Supplier shall be recognized architectural finish hardware supplier, with warehousing facilities, who have been furnishing hardware in the project vicinity for a period of not less than 2 years and who is or employs a DHI Certified AHC or person with a minimum of 10 years of experience as a hardware supplier. This person shall be available at reasonable times during the course of the work for consultation about products hardware requirements, to the Owner, architect, and CONTRACTOR.
- C. **Installer Qualifications (Mechanical Hardware):** All finish hardware shall be installed by the finish hardware installer with a minimum of at least 2 years documented experience. Installer shall attend a pre-installation meeting between the contractor, finish hardware supplier, hardware manufacturers representative for locks, closers and exit devices, all door/frame suppliers. The finish hardware installer shall be responsible for the proper installation and function of all doors and hardware.
- D. **Installer Qualifications (Electrified Hardware):** All electrified finish hardware (power, load, switch, conductor and monitoring device) shall be installed by a Electronic Access Control installer licensed by the Texas Department of Public Safety. The electrified finish hardware installer shall have a minimum of at least 2 years of documented experience. Installer shall attend a pre-installation meeting between the contractor, finish hardware supplier, electrical contractor, fire alarm contractor, security contractor, hardware manufacturers representative for locks, closers and exit devices, all door/frame suppliers. The electrified finish hardware installer shall be responsible for the proper installation and function of all doors and hardware. Installation shall include wiring all electrified products (including the required wire to the power supply and/or junction box).
- E. **Regulatory Requirements:**
 - 1. Provide hardware for fire resistive rated openings that complies with UL and listed by UL.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. **Delivery:**
 - 1. Deliver hardware where directed in unopened packages with items packed separately, complete and ready for installation with necessary fittings, trim, fasteners, and accessories.
 - 2. Provide packages bearing the manufacturers' labels, with each item or group of items identified according to the accepted hardware schedule.
 - 3. At time of delivery, inventory hardware jointly with representatives of hardware supplier and hardware installer until each is satisfied that count is correct.
- B. **Storage:** Store hardware in enclosed, dry and locked area.

1.08 MAINTENANCE

- A. Require lockset manufacturers to deliver permanent removable cylinder cores and keys and minimum 2 extractor keys to Owner directly.

- B. Extra Materials:
 1. All extra screws, fasteners, and all special installation tools furnished with the hardware shall be turned over to the Owner at the completion of the job.

1.09 WARRANTY

- A. All finish hardware products shall be covered by a 1-year factory warranty from the date of substantial completion of the project. Exit Devices shall carry a 3-year warranty; Mechanical Door Closers shall carry a 10-year warranty.
- B. Supply warranty verification to the Owner for all products that provide factory warranty.

1.10 SCHEDULING AND SEQUENCING

- A. Upon receipt of accepted hardware schedule, coordinate accepted hardware schedule, templates, reinforcing units, and template instructions to door and frame sections.
- B. Restrict distribution of construction keys to superintendents and foremen. Maintain record of persons who have received keys on construction distribution list.

PART 2 PRODUCTS

2.01 SUSTAINABILITY CHARACTERISTICS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design compliance.
- B. Materials and Resources Characteristics:
 1. Recycled Content Materials: Furnish materials with maximum available recycled content.

2.02 MANUFACTURES

- A. Manufacturers as follows:

Manufacturer	Abbreviation	Website
Best Access	BES	www.bestaccess.com
Bommer Industries, Inc.	BOM	www.bommer.com
Falcon	FAL	www.falconlock.com
Glynn Johnson	GLY	www.glynn-johnson.com
Hager Hinge Company	HAG	www.hagerhinge.com
Ives	IVE	www.ives.ingersollrand.com
LCN	LCN	www.lcnclosers.com
National Guard	NGP	www.ngpinc.com
Rockwood	ROC	www.rockwoodmfg.com
Schlage	SCH	www.schlage.com

Trimco/BBW/Quality	TRI	www.trimcobbw.com
Von Duprin	VON	www.vonduprin.com
Zero	ZER	www.zerointernational.com

2.03 MATERIALS

A. Fasteners:

1. All closers and exit devices provided for exterior doors and hollow metal doors shall be provided with thru-bolts.
2. All finish hardware shall be installed to manufacturers recommendations, using screws, attachments and installation tools provided with the hardware. No other screws or attachments are acceptable.
3. All other products to meet door and frame conditions.
4. Finish: Stainless steel, unless otherwise required to match material and hardware finish.

B. Hinges:

1. Manufacturers: One of the following or equal:
 - a. Ives.
 - b. Hager.
 - c. Bommer.
2. Template: Provide templated units only.
3. Exterior: All exterior hinges shall be stainless steel base and finish.
4. Interior: All interior hinges stainless steel base and finish.
5. Exit devices: All hinges on doors with exit devices shall be heavy weight.
6. Electric Hinge: Provide 8 wire.
7. Provide non-removable pins for out-swinging doors that are locked or are lockable.
8. All hinges shall be ball bearing; concealed with interior self-lubricating bushings.
9. All hinges shall be five knuckle.
10. All hinges shall be full mortise.
11. Size: Provide 4-1/4 by 4-1/2 hinges on doors up to 3 feet 0 inches in width. Provide 5 by 4-1/4 hinges on door from 3 feet 2 inches to 4 feet 0 inches in width. Reference manufacturers catalog for all other sizes.
12. Number of Hinges: Provide number of hinges indicated but not less than 3 hinges for door leaf for doors 90 inches or less in height and one additional hinge for each 30 inches of additional height.
13. The width of hinge shall be sufficient to clear all trim.

C. Continuous Hinges:

1. Manufacturers: One of the following or equal:
 - a. Ives.
 - b. Select.
 - c. Zero.
2. Continuous hinges to be manufactured of 6063-T6 aluminum alloy with anodized finish.
3. Continuous hinge to be cut in the field for power transfer.
4. Continuous hinge shall be certified to ANSI 156.25, Grade 2.
5. Continuous hinge should be tested an approved UL10C.

D. Cylindrical Locks/Latches:

1. Supply from the following list of manufacturers:
 - a. Best Lock – 93K series – No substitution.
2. Provide cylindrical locksets that comply with ANSI A156.2, Series 4000, Grade 1; tested to exceed 3,000,000 cycles. Functions as listed in Hardware Sets.
3. Provide cylindrical locksets that meet ANSI A117.1, Accessibility Code.
4. Provide cylindrical locksets that meet UL A label; to have a minimum listing for single doors 4 feet by 8 feet.
5. Provide cylindrical locksets that comply with the Fire Safety Code; lever return to within 1/2 inch of the door where applicable.
6. Chassis to be one-piece, modular assembly.
7. Levers are to be solid. Manufacturers utilizing fillers of any kind are not acceptable.
8. Levers are to be plated to match BHMA finishes.
9. Levers to have grooved tactile warnings on back side of lever where shown in hardware sets. Manufacturers that insert devices and/or apply materials for warning are not acceptable.
10. Thru-bolts to be a minimum of 1/4 inch in diameter.
11. Thru-bolts to secure anti-rotation plate without sheer line. Manufacturers utilizing fully threaded thru-bolts are not acceptable.
12. Adjustment plate to be threaded for door thickness adjustment.
13. Latchbolt to be steel with minimum 1/2 inch throw deadlatch on keyed and exterior functions; 3/4 inch throw anti-friction latchbolt on pairs of doors.
14. Strike to be ANSI curved lip, 1-1/4-inch by 4-7/8-inch, 16 gauge, with 1-inch deep box construction.

E. Pull Plates:

1. Supply from the following list of manufacturers:
 - a. Ives.
 - b. Trimco.
 - c. Rockwood.
2. Pull Plates to meet ANSI 156.6 for .050 inch thickness. Plate size to 4- by 16-inch with 1-inch round on pull plate.

F. Push Plates:

1. Supply from the following list of manufacturers:
 - a. Ives.
 - b. Trimco.
 - c. Rockwood.
2. Push Plates to meet ANSI 156.6 for .050 inch thickness. Plate size to be 4- by 16-inch.

G. Door Closers:

1. Supply from the following list of manufacturers:
 - a. LCN 4010/4100.
 - b. Doromatic/Falcon.
 - c. Norton.
2. All door closers on this project should be manufactured by the same manufacturer.
3. Door closers shall meet the minimum requirements of the 1990 ADA act, in lieu of ANSI Standard A156.4 and ANSI, Grade 1 on interior fire rated openings.

4. Door closers shall be furnished with standard cover. Provide full cover as shown in hardware sets.
5. Size in accordance with the manufacturers recommendations for door size and condition.
6. Door closers shall be furnished with backcheck, delayed action, hold-open and advanced backcheck as listed in the Hardware Sets.
7. Provide and mount closer top jamb or on brackets and/or drop plates, where special conditions call for it.
8. All closer installation shall include thru bolts on all doors.
9. Door closers shall be cast iron.
10. Door closers shall be certified to exceed ten million full load operating cycles by a recognized independent testing laboratory.
11. Door closers shall be plated to match locks and exit devices.
12. Door closers shall be non-handed.

H. Exit Devices:

1. Supply from the following list of manufacturers:
 - a. Falcon 24/25 Series.
 - b. Von Duprin 33/99 Series.
2. All exit device types on this project should be manufactured by the same manufacturer.
3. Exit devices are to be architectural grade touch bar type. Mechanism case to be smooth.
4. Exit devices shall meet ANSI A156.3, 1994, Grade 1. All exit devices are UL listed for Accident Hazard or Fire Exit Hardware.
5. All lever trim to match lock trim in design and finish.
6. Dogging: All non-rated devices are to be provided with dogging. Cylinder dogging as shown in hardware sets.
7. Exit devices are to be supplied and installed with thru-bolts for all doors.
8. Mullion shall be removable. Keyed removable as shown in hardware sets.
9. Provide proper power supply for exit devices as required.
10. Exit devices shall have a flush end cap.
11. Exit devices shall be ordered with the correct strike for application.
12. Exit devices shall be order in the proper length to meet door width.
13. Exit devices shall have deadlatching.
14. Install exit devices with fasteners supplied by exit device manufacturer.
15. Provide glass bead kits as required.
16. Provide proper concealed vertical rods for wood or hollow metal doors as required.

I. Flush Bolts (Fully Automatic):

1. Supply from the following list of manufacturers:
 - a. Ives (FB30/FB40).
 - b. Trimco.
 - c. Rockwood.
2. Provide automatic flush bolts that remains latched until the active leaf door is opened in all door in the means of egress, whether or not required for egress width
3. Inactive door is latched when active door closes, bolts retract when active door is opened. Top bolt has no spring tension. Low actuating force.
4. Fits standard ANSI A115.4 door frame preparations.
5. Non – handed.

6. Provide UL listed for fire doors as required.
7. Models with Auxiliary Fire Latch eliminates the bottom bolt and is UL listed for fire doors.
8. Finished cover plates permit finish changes in stock or at job site.
9. Bolts have 3/4-inch throw with a 7/8-inch vertical adjustment.
10. Standard rod length is 12 inches, which is measure from the center of the flush bolt body to the bolt tip. Provide optional rod lengths for top bolt for non-fire rated openings.
11. Meets ANSI A156.3 Type 25.
12. Provide all necessary strikes, shims and guides to insure proper installation.

J. Coordinator:

1. Supply from the following manufacturer:
 - a. Ives (COR).
 - b. Trimco.
 - c. Rockwood.
2. Provide coordinator that is a bar type.
3. UL listed for fire doors.
4. Provide filler bar as required for door width.
5. Provide all mounting brackets as required for installation of door closer, strikes, etc.
6. Meets ANSI/BHMA A156.3, Type 21A.

K. Door Stops and Holders:

1. Supply from the following list of manufacturers:
 - a. Ives.
 - b. Trimco.
2. Wall and Floor Stops: Supply wall stops where needed to protect doors or door hardware. When wall conditions do not permit use of wall stop provide floor stops with risers as needed to adjust for floor conditions.
3. Overhead Stops: Where wall or floors stops are not applicable provide surface overhead stops.
4. Exterior Stops: Provide security floor stop.

L. Silencers:

1. Supply from the following list of manufacturer's:
 - a. Ives (SR64/SR65).
 - b. Rockwood.
 - c. Trimco.
2. Provide silencers on all doors without seal. 3 for single doors and 2 for pairs.
3. Provide silencers as required for frame conditions.

M. Thresholds/Weatherstripping:

1. Supply from the following list of manufacturer's:
 - a. National Guard.
 - b. Zero.
2. All thresholds shall conform to state and local handicap codes.
3. Smoke seal shall be teardrop design bulb seal.
4. Exterior seal/thresholds shall be silicone or brush as shown in hardware sets.
5. Sound seal shall be neoprene.
6. Drip strips shall protrude 2-1/2 inches.
7. Provide door sweeps.

8. Provide UL meeting stile gasketing for fire rated doors.

2.04 KEYING

- A. General:
 1. Finish Hardware Supplier shall meet in person with Owner to finalize keying requirements and match existing or start a new Restricted and Patented Master Key System for the project.
- B. Cylinders:
 1. All cylinder/cores on this project should be manufactured and providing in the same keyway.
 2. Provide the correct and quantity of cylinders for all applications.
- C. Cores:
 1. Provide cores with finger pins that provide a second shear line.
- D. Keys:
 1. Provide nickel silver keys only.
 2. Furnish 2 change keys for each lock: 5 control keys: 5 master keys for each master system and 5 grandmaster keys for each grandmaster key system.
 3. Emboss DO NOT DUPLICATE on keys.
 4. Deliver all keys to Owner's representative.
- E. Cores and keys shall be provided with identification stamping.
- F. Provide construction keying / construction cores for this project with construction keys.
- G. Key Control:
 1. Key Management: Key control shall be provided, by supplying a complete key storage and management system.
 - a. Each key shall be fully cut, indexed, tagged and installed on cabinet hooks by the lock supplier and shipped with the locks.
 - b. Key cabinet provided shall be wall-mounted type with capacity plus 50 percent.

2.05 FINISHES

- A. Butts:
 1. Interior Non Labeled: Finish – 652.
 2. Interior Labeled: Finish – 652.
 3. Interior Corrosive Area: Finish – 630.
 4. Exterior: Finish – 630.
 5. Continuous Hinges: Finish – ALUM.
- B. Flush Bolts/Dust Proof Strikes: Finish – 626.
- C. Locks/Latches: Finish – 626.
- D. Cylinders: Finish – 626.
- E. Exit Devices: Finish – 630.

- F. Door Closers: Finish – 626.
- G. Push Plates: Finish – 630.
- H. Pull Plates: Finish – 630.
- I. Protective Plates: Finish – 630.
- J. Door Stops and Holders: Finish – 626.
- K. Overhead Stops/ HOLDERS: Finish – 626.
- L. Weatherstrip and Threshold: Finish – ALUM.

PART 3 EXECUTION

3.01 GENERAL

- A. Inspect doors and door frames for damage or defects and examine hardware for compatibility with receiving conditions and suitable to intended use.
- B. Verify that required wall backing has been installed.

3.02 INSTALLATION

- A. Install finish hardware in accordance with manufacturer's templates and instructions.
- B. Accurately and properly fit hardware.
- C. Securely fasten fixed parts for smooth, trouble-free, non-binding operation.
- D. Fit faces of mortise parts snug and flush.
- E. Ensure that operating parts move freely and smoothly without binding, sticking, or excessive clearance.
- F. Pre Installation meeting required with attendees to include Architect/Engineer, Contractor, Mechanical Hardware and Electrified Hardware Installer, Finish Hardware Supplier and Manufacturer's Representative for Exit Device, Locks and Closers before installation begins.

3.03 FIELD QUALITY CONTROL

- A. After installation has been completed, obtain the services of an Architectural Hardware Consultant to check for proper installation of finish hardware, according to the finish hardware schedule and keying schedule. In addition, check all hardware for adjustments and proper operation.

3.04 ADJUSTING

- A. Adjust, clean and inspect all hardware, to ensure proper operation and function of every opening. Replace items, which cannot be adjusted to operate freely and smoothly as intended for the application made.

3.05 CLEANING AND PROTECTION

- A. Protect door hardware from damage or marring of finish during construction, use strippable coatings, removable tapes, or other acceptable means.
- B. Ensure door hardware displays no evidence of finish paint after final building clean-up.
- C. Remove protective materials and devices and thoroughly clean exposed surfaces of hardware. Check for surface damage prior to final cleaning for acceptance of project.

3.06 TRAINING

- A. After installation has been completed, provide training to the Owner on the operation of finish hardware and programming of any access control items.

3.07 HARDWARE LIST

56611 OPT0219766 Version 2

Hardware Group No. 001

For use on Door #(s):

102 103 107 110 111

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	DOOR PULL, 1" ROUND	8103-EZ-PR-N 10"	630	IVE
1		NOTE	HARDWARE BY DOOR MANUFACTURER		UNK

Hardware Group No. 200ACR

For use on Door #(s):

203

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	SET	AUTO FLUSH BOLT	FB31P/FB41P AS REQ	630	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1		STOREROOM LOCK	9K3 7 D 14D STK	626	BES
1	EA	PERMANENT CORE	KEYED AS DIRECTED		BES
1	EA	COORDINATOR	COR X FL X MB AS REQUIRED	628	IVE
2	EA	SURFACE CLOSER	SC71 SS	689	FAL
1	EA	SEAL SET	GASKETING BY DOOR/FRAME MANUFACTURER		UNK
1	EA	MEETING STILE	MEETING STILE BY DOOR MANUFACTURER		UNK

Hardware Group No. 203AS

For use on Door #(s):

115

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1		STOREROOM LOCK	9K3 7 D 14D STK	626	BES
1	EA	PERMANENT CORE	KEYED AS DIRECTED		BES
1	EA	OH STOP	450S	630	GLY
1	EA	SEAL SET	GASKETING BY DOOR/FRAME MANUFACTURER		UNK

Hardware Group No. 301F

For use on Door #(s):

108 109

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1		PRIVACY LOCK	9K3 7 L 14D	626	BES
1	EA	SURFACE CLOSER	SC71 RW/PA	689	FAL
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	626	IVE
1	EA	FLOOR STOP	FS436	626	IVE
3	EA	SILENCER	SR65	GRY	IVE

Hardware Group No. 501AC

For use on Door #(s):

114

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1		CYLINDRICAL LOCK	93K 7 R 14D	626	BES
1	EA	PERMANENT CORE	KEYED AS DIRECTED		BES
1	EA	SURFACE CLOSER	SC71 SS	689	FAL
1	EA	SEAL SET	GASKETING BY DOOR/FRAME MANUFACTURER		UNK

Hardware Group No. 701R

For use on Door #(s):

105

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	224XY	628	IVE
1	EA	FIRE EXIT HARDWARE	F-25-R-L-QUA	626	FAL
1	EA	RIM CYLINDER	TYPE AS REQ TO MATCH EXISTING KEY SYSTEM	626	BES
1	EA	PERMANENT CORE	KEYED AS DIRECTED		BES
1	EA	SURFACE CLOSER	SC71 RW/PA	689	FAL
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	626	IVE
1	EA	WALL STOP	WS407CCV	630	IVE
1	SET	SEALS	188S H & J	BLK	ZER

Hardware Group No. C001

For use on Door #(s):

80ER1 80ER2

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CREDENTIAL READER	BY SECURITY CONTR.	FBO	UNK
1	EA	POWER SUPPLY	POWER SUPPLY FOR CARD READER BY SECURITY CONTRACTOR		
1	EA	NOTE	RE-USE REMAINDER OF HARDWARE		

Hardware Group No. C201

For use on Door #(s):

106

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	FAIL SECURE ELECTRIFIED LOCK	9K37DEU 14D RQE	626	BES
1	EA	PERMANENT CORE	KEYED AS DIRECTED		BES
1	EA	SURFACE CLOSER	SC71 RW/PA	689	FAL
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	626	IVE
1	EA	WALL STOP	WS407CCV	630	IVE
3	EA	SILENCER	SR65	GRY	IVE
1	EA	CREDENTIAL READER	BY SECURITY CONTR.	FBO	UNK
1	EA	POWER SUPPLY	POWER SUPPLY BY SECURITY CONTRACTOR		UNK
1	EA	POWER SUPPLY	POWER SUPPLY FOR CARD READER BY SECURITY CONTRACTOR		
1	EA	DOOR CONTACT	DOOR CONTACT BY ANOTHER SECTION/PROVIDED BY SECURITY CONTRACTOR		UNK

Hardware Group No. C710CMR

For use on Door #(s):

202

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	224XY EPT	628	IVE
2	EA	POWER TRANSFER	EPT10	689	VON
1	EA	FIRE RATED REMOVABLE MULLION	KR9954 Length as req	689	VON
1	EA	MORTISE CYLINDER	TYPE AS REQ - KEYED TO MATCH EXISTING KEY SYSTEM	626	BES
1	EA	ELEC FIRE EXIT HARDWARE	RX-MEL-F-25-R-L-DT-QUA-CON- SNB 24 VDC	626	FAL
1	EA	ELEC FIRE EXIT HARDWARE	RX-MEL-F-25-R-L-NL-QUA-CON- SNB 24 VDC	626	FAL
1	EA	RIM CYLINDER	TYPE AS REQ TO MATCH EXISTING KEY SYSTEM	626	BES
2	EA	PERMANENT CORE	KEYED AS DIRECTED		BES
2	EA	SURFACE CLOSER	SC71 SS	689	FAL
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	626	IVE
1	SET	SEALS	188S H & J	BLK	ZER
1	EA	CREDENTIAL READER	BY SECURITY CONTR.	FBO	UNK
1	EA	POWER SUPPLY	POWER SUPPLY BY SECURITY CONTRACTOR		UNK
1	EA	POWER SUPPLY	POWER SUPPLY FOR CARD READER BY SECURITY CONTRACTOR		
2	EA	DOOR CONTACT	DOOR CONTACT BY ANOTHER SECTION/PROVIDED BY SECURITY CONTRACTOR		UNK

Hardware Group No. C714M

For use on Door #(s):

E-102

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	224XY EPT	628	IVE
2	EA	POWER TRANSFER	EPT10	689	VON
1	EA	REMOVABLE MULLION	KR4954 STAB	689	VON
1	EA	MORTISE CYLINDER	TYPE AS REQ - KEYED TO MATCH EXISTING KEY SYSTEM	626	BES
1	EA	ELEC PANIC HARDWARE	RX-MEL-25-R-L-DT-QUA-CON-SNB 24 VDC	626	FAL
1	EA	ELEC PANIC HARDWARE	RX-MEL-25-R-L-NL-QUA-CON-SNB 24 VDC	626	FAL
1	EA	RIM CYLINDER	TYPE AS REQ TO MATCH EXISTING KEY SYSTEM	626	BES
2	EA	PERMANENT CORE	KEYED AS DIRECTED		BES
2	EA	SURFACE CLOSER	SC71 SS	689	FAL
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	626	IVE
1	EA	RAIN DRIP	142AA + 4" OVER DOOR WIDTH	AA	ZER
1	EA	MEETING STILE	328AA (2 PCS - 1 SET) HEIGHT AS REQUIRED	AA	ZER
1	EA	GASKETING SET	328AA -S	AA	ZER
2	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	65A LENGTH AS REQ	A	ZER
1	EA	CREDENTIAL READER	BY SECURITY CONTR.	FBO	UNK
1	EA	POWER SUPPLY	POWER SUPPLY BY SECURITY CONTRACTOR		UNK
1	EA	POWER SUPPLY	POWER SUPPLY FOR CARD READER BY SECURITY CONTRACTOR		
2	EA	DOOR CONTACT	DOOR CONTACT BY ANOTHER SECTION/PROVIDED BY SECURITY CONTRACTOR		UNK

Hardware Group No. C715

For use on Door #(s):

113.1 113.3 E-20PD E-101.1 E-101.3 E-101.4
 E-101.5

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	224XY EPT	628	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC PANIC HARDWARE	RX-MEL-25-R-L-NL-QUA-CON-SNB 24 VDC	626	FAL
1	EA	RIM CYLINDER	TYPE AS REQ TO MATCH EXISTING KEY SYSTEM	626	BES
1	EA	PERMANENT CORE	KEYED AS DIRECTED		BES
1	EA	SURFACE CLOSER	SC71 SS	689	FAL
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	626	IVE
1	EA	RAIN DRIP	142AA + 4" OVER DOOR WIDTH	AA	ZER
1	EA	GASKETING SET	328AA -S	AA	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	65A LENGTH AS REQ	A	ZER
1	EA	CREDENTIAL READER	BY SECURITY CONTR.	FBO	UNK
1	EA	POWER SUPPLY	POWER SUPPLY BY SECURITY CONTRACTOR		UNK
1	EA	POWER SUPPLY	POWER SUPPLY FOR CARD READER BY SECURITY CONTRACTOR		
1	EA	DOOR CONTACT	DOOR CONTACT BY ANOTHER SECTION/PROVIDED BY SECURITY CONTRACTOR		UNK

Hardware Group No. C715A

For use on Door #(s):

100

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	224XY EPT	628	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC PANIC HARDWARE	RX-MEL-25-R-L-NL-QUA-CON-SNB 24 VDC	626	FAL
1	EA	RIM CYLINDER	TYPE AS REQ TO MATCH EXISTING KEY SYSTEM	626	BES
1	EA	PERMANENT CORE	KEYED AS DIRECTED		BES
1	EA	SURFACE CLOSER	SC71 SS	689	FAL
1	EA	SEAL SET	GASKETING BY DOOR/FRAME MANUFACTURER		UNK
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	65A LENGTH AS REQ	A	ZER
1	EA	CREDENTIAL READER	BY SECURITY CONTR.	FBO	UNK
1	EA	POWER SUPPLY	POWER SUPPLY BY SECURITY CONTRACTOR		UNK
1	EA	POWER SUPPLY	POWER SUPPLY FOR CARD READER BY SECURITY CONTRACTOR		
1	EA	DOOR CONTACT	DOOR CONTACT BY ANOTHER SECTION/PROVIDED BY SECURITY CONTRACTOR		UNK

Hardware Group No. D001

For use on Door #(s):

113.2 E-20RUD E-101.2

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	DOOR CONTACT	DOOR CONTACT BY ANOTHER SECTION/PROVIDED BY SECURITY CONTRACTOR		UNK
1		NOTE	HARDWARE BY DOOR MANUFACTURER		UNK

END OF SECTION

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SECTION 08800

GLAZING

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Glass and glazing.

1.02 REFERENCES

- 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. American National Standards Institute (ANSI):
1. Z97.1 – Safety Performance Specifications and Methods of Test for Transparent Safety Glazing Materials Used in Buildings.
- C. ASTM International (ASTM):
1. C 669 – Standard Specification for Glazing Compounds for Back Bedding and Face Glazing of Metal Sash.
 2. C 1193 – Standard Guide for Use of Joint Sealants.
 3. C 1036 – Standard Specification for Flat Glass.
 4. C 1048 – Standard Specification for Heat-Treated Flat Glass – Kind HS, Kind FT Coated and Uncoated Glass.
 5. E 330 – Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors By Uniform Static Air Pressure Difference.
 6. E 546 – Standard Test Method for Frost Point of Sealed Insulating Glass Units.
 7. E 576 – Standard Test Method for Frost Point of Sealed Insulating Glass Units in the Vertical Position.
 8. E 773 – Standard Test Method for Accelerated Weathering of Sealed Insulating Glass Units.
 9. E 1425 – Standard Practice for Determining the Acoustical Performance of Exterior Windows and Doors.
 10. E 2190 – Standard Specification for Insulating Glass Unit Performance and Evaluation
- D. Consumer Product Safety Commission (CPSC):
1. 16 CFR 1201 – Safety Standard for Architectural Glazing Materials.
- E. Glass Association of North America (GANA):
1. GANA GM – Glazing Manual.
 2. GANA – FGMA Sealant Manual.
 3. GANA – Laminated Glass Design Guide.
- F. Insulating Glass Certification Council (IGCC):
1. Certified Products Directory.

- G. Underwriters Laboratories Inc.:
 - 1. UL – Building Materials Directory.

1.03 DESIGN AND PERFORMANCE CRITERIA

- A. Performance Requirements:
 - 1. Provide glass and glazing materials for continuity of building enclosure vapor retarder and air barrier:
 - a. In conjunction with materials described in Section 08800.
 - b. To utilize inner pane of multiple pane sealed units for continuity of air barrier and vapor retarder seal.
 - c. To maintain continuous air barrier and vapor retarder throughout glazed assembly from glass pane to heel bead of glazing sealant.
 - 2. Size glass to withstand dead loads and positive and negative live loads acting normal to plane of glass as calculated in accordance with 2009 International Building Code and ANSI Z 97.1
 - 3. Limit glass deflection to 1/200 or flexure limit of glass with full recovery of glazing materials, whichever is less.

1.04 SUBMITTALS

- A. Product Data:
 - 1. Glass: Provide structural, physical, and thermal and solar optical performance characteristics, size limitations, special handling or installation requirements.
 - 2. Glazing Sealants, Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements. Identify available colors where exposed.
- B. Design Data: Signed and sealed by professional engineer.
 - 1. Submit design calculations for glass thicknesses.
- C. Shop drawings: Locations of glass types and typical glazing details.
- D. Samples: As follows:
 - 1. Glass, 1 square foot of each type specified.
 - 2. Glazing sealants, 2-inch long beads, for color selection.
- E. Certificates of Compliance: Certification that tempered glass conforms to ANSI Z97.1 and 16 CFR 1201.
- F. Manufacturer's Installation Instructions.

1.05 SUSTAINABLE DESIGN SUBMITTALS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
 - 1. Materials Resources Certificates:
 - a. Certify recycled material content for recycled content products.

2. Indoor Air Quality Certificates:
 - a. Certify volatile organic compound content for each interior adhesive and sealant and related primer.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle materials in manner to prevent damage.
- B. Deliver and store packaged materials in original containers bearing manufacturer's name.
- C. Deliver glass affixed with manufacturer's labels showing strength, grade, thickness, type, and quality of glass, and for insulating glass, IGCC certification label.
- D. Remove labels after installation, inspection and final acceptance.

1.07 PROJECT CONDITIONS

- A. Perform glazing when ambient air temperature is 40 degrees Fahrenheit or above.
- B. Regulatory Requirements:
 1. Wind loading: In accordance with Section 01614 - Wind Design Criteria.
 2. Provide glass and glazing that conforms to CPSC 16 CFR, Part 1201, and exit requirements of 2009 International Building Code.

1.08 WARRANTY

- A. Section 01700 – Contract Closeout: Product warranties and product bonds.
- B. Furnish 5 year warranty to include coverage for sealed glass units from seal failure, interpane dusting or misting, and replacement of same.
- C. Material and workmanship shall be warranted for a period of two years from the Date of Substantial Completion, against water penetrations, air leakage, excessive deflection and sealant failure or hardening.

PART 2 PRODUCTS

2.01 SUSTAINABILITY CHARACTERISTICS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design compliance.
- B. Materials and Resources Characteristics:
 1. Recycled Content Materials: Furnish materials with maximum available recycled content.
- C. Indoor Environmental Quality Characteristics:
 1. Interior Adhesives: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.
 2. Interior Sealants and Sealant Primers: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.

2.02 GLASS

- A. Clear Tempered: ASTM C 1048, Kind FT, Condition A, Type I, Class 1 or Class 2 as scheduled below, Quality q3; tempered without visible tong marks when installed; minimum 1/4 inch thick. Manufacturers: One of the following or equal:
 - 1. Vitro Architectural Glass (formerly PPG), Cheswick, PA.
 - 2. Guardian Industries Corp., Auburn Hills, MI.

- B. Tinted Tempered: ASTM C 1048, Kind FT, Condition A, Type I, Class 1 or Class 2 as scheduled below, Quality q3; tempered without visible tong marks when installed; minimum 1/4 inch thick; Pacifica tint. Manufacturers: One of the following or equal:
 - 1. Vitro Architectural Glass (formerly PPG), Cheswick, PA.
 - 2. Guardian Industries Corp., Auburn Hills, MI.

- C. Insulating glass units: IGCC Rating Level CBA when tested in accordance with ASTM E 773 and E 2190; hermetically sealed units consisting of minimum 1/4 inch thick, tinted exterior light, minimum 1/4 inch thick, clear interior light, and 1/2 inch wide air space 90% Argon Fill, dehydrated with blended molecular sieve and silica gel desiccant, with metal spacer channel with bent corners and welded splice on one vertical side, and polyisobutylene primary and silicone secondary seals. Manufacturers: One of the following or equal:
 - 1. Vitro Architectural Glass (formerly PPG), Cheswick, PA.
 - a. Double Pane Insulating Glass:
 - 1) Total Unit Thickness: 1 inch.
 - 2) Product: Solarban 70 Pacifica with coating Low-E #2; manufactured by Vitro (formerly PPG).
 - 3) Outer Pane: Glass Type Tinted Monolithic.
 - 4) Air Space: 90% Argon Fill.
 - 5) Inner Pane: Glass Type Clear Monolithic.
 - 6) U-Factor Winter Nighttime: 0.24 maximum.
 - 7) U-Factor Summer Daytime: 0.21 maximum.
 - 8) Solar Heat Gain Coefficient: 0.31 maximum.
 - 9) UV Transmittance: 6% maximum.
 - 10) Visible Light Transmittance: 64% minimum.
 - 11) Solar Transmittance: 25% maximum.
 - 2. Guardian Industries Corp., Auburn Hills, MI:
 - a. Equivalent product.

2.03 GLAZING MATERIALS

- A. Setting blocks: Neoprene, 80 to 90 durometer.

- B. Spacer blocks: 30 to 40 durometer, thickness equal or greater than insulated window thickness by minimum 6 inches long.

- C. Pressure tape: Butyl rubber tape. Manufacturers: One of the following or equal:
 - 1. Tremco Mfg. Co., Tremco 440 Tape.
 - 2. 3-M Co., Weatherban 5422.

- D. Sealant: Silicone. ASTM C920, Type S, Grade NS, Class A and Use suitable for glazing application indicated; single component; solvent curing; capable of water

immersion without loss of properties; non-bleeding, non-staining, cured Shore A hardness of 15 to 25.

1. Product: Silicone Construction Sealant Series SCS-1200, manufactured by General Electric Co.
2. Color: As selected.
3. Structural Silicone: Furnish high-modulus structural silicone glazing materials where sealant bonds glass to substrate.
4. Interior Sealants and Sealant Primers: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.
5. Manufacturers: One of the following or equal:
 - a. General Electric Co., Silicone Construction Sealant Series SCS-1200.
 - b. Dow Corning Corp., 999-A, Silicone Building and Glazing Sealant.

- E. Glazing gaskets and other materials for exterior openings:
1. Aluminum entrances and storefronts: As specified in Section 08410.

2.04 SOURCE QUALITY CONTROL

- A. Allowable bow and warp tolerances: As measured with glass resting on edge upon two 1 inch wide supports:
1. Typical: Maximum 1/8 inch in 48 inches.
 2. Tempered glass: Maximum allowed by ASTM C 1048.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine openings to receive glass for defects that would affect glass and glazing work.
- B. Verify removal of rivets, screws, bolts, welding fillets or other projections from clearances in glazing rabbets.

3.02 PREPARATION

- A. Examine frames receiving glass and ensure surfaces are clean and dry.
- B. Remove dust and oil from glass by wiping clean immediately before installation.
- C. Verify that sealants are compatible with glazing materials.

3.03 INSTALLATION OF MONOLITHIC GLASS

- A. Conform to GANA Glazing Manual, manufacturer's instructions and accepted shop drawings by the Engineer.
- B. Glaze doors in closed position after hanging and adjustment.
- C. Accurately size and cut glass clean for each glazing condition. Do not nip edges.

- D. Cut and set glass to full fit and play consistent with expansion and contraction requirements and at exterior for absolute security under maximum high velocity wind and vacuum stresses.
- E. Maintain edge clearance at least equal to glass thickness from perimeter of glass to inside of rabbet.
- F. Maintain 1/8-inch clearance between faces of glass and adjacent stop or bead.
- G. Maintain minimum bite of 3/8 inch.
- H. Set glass as required to ensure against optical distortion.

3.04 INSTALLATION OF INSULATED GLASS UNITS

- A. Conform to GANA Glazing Manual, manufacturer's instructions and accepted shop drawings by the Engineer.
- B. Use wet and dry glazing method.
- C. Cut glazing tape to length and set against permanent stops to project 1/16 inch above sight line.
- D. Place setting blocks at quarter points and no closer than 6 inches from corners.
- E. Rest glazing on setting blocks and push against tape for full contact at perimeter of unit.
- F. Place glazing gasket. Install removable stop with concealed leg notched to accommodate setting blocks. Align top of gasket with stops.

3.05 INSTALLATION OF GASKETS

- A. Gaskets: Install in accordance with manufacturer's instructions.
- B. Glazing of interior metal frames: Use pressure or foamed tape and sealant as indicated as required to eliminate rattle and reduce sound transmission.

3.06 SEALANT APPLICATION

- A. Comply with applicable requirements of Section 08800, unless specifically noted otherwise.
- B. Ensure protective coatings have been removed from aluminum surfaces.
- C. Where setting blocks and spacer shims are required to be set in sealant, butter with sealant, place into position and allow to set prior to installation of glass.
- D. Neatly tool sealant or compound joints to compress material and improve adhesion.
- E. Repair or replace pockets exposed by tooling.

3.07 CLEANING

- A. After inspection by Engineer, remove labels and marks from glass in accordance with manufacturers' published recommendations.
- B. Clean glass and surrounding surfaces from spatter and blemishes resulting from glazing operations.
- C. Clean and polish glass inside and outside.
- D. Clean glass with a soft, clean, grit free cloth and mild soap, detergent, or slightly acidic cleaning solution. Immediately rinse with clean water and remove excess rinse water with a clean squeegee. Do not use an abrasive cleaner.
- E. Remove grease and miscellaneous glazing materials with commercial solvent. Follow with normal wash and rinse. Be careful not to damage joint sealers.

3.08 GLASS AND LOCATION SCHEDULE

- A. Exterior locations: Glass as follows, unless otherwise scheduled or indicated on the Drawings:
 - 1. Typical: Insulating, tinted.
 - 2. Non-fire rated doors: Tinted and tempered.
 - 3. Storefront Entrance doors: Insulating, Tempered and tinted.
 - 4. Windows within 48 inches of doors: Insulating, tinted and tempered.
- B. Interior locations: Glass as follows, unless otherwise scheduled or indicated on the Drawings:
 - 1. Typical: Clear and tempered.
 - 2. Non-fire rated doors: Clear and tempered.
 - 3. Windows within 48 inches of doors: Clear and tempered.

END OF SECTION

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SECTION 09260

GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
1. Interior Paperless Moisture Resistant wall panels and joint treatment
 2. Abuse Resistant Gypsum Panels
 3. Water resistant Tile backer board.
 4. Metal stud wall framing.
 5. Metal channel ceiling framing.

1.02 REFERENCES

- 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:
1. A 123- Zinc (Hot-dip galvanized) coatings on iron and steel products.
 2. A 525 – General requirements of sheet steel, zinc- coated (Galvanized) by the Hot-Dip Process. Sheet steel, Cold-Rolled, Electrolytic Zinc-Coated.
 3. C 475 – Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
 4. C 514 – Standard Specification for Nails for the Application of Gypsum Wallboard.
 5. C 645 – Standard Specification for Non-Load (Axial) Bearing Steel Studs, Runners (Track), and Rigid Furring Channels for Screw Application of Gypsum Board.
 6. C 754 – Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Board.
 7. C 840 – Standard Specification for Application and Finishing of Gypsum Board.
 8. C 1002 – Standard Specification for Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases.
 9. C 1177 – Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing
 10. C1280 – Standard Specification for Application of Gypsum Sheathing
 11. C 1396 – Standard Specification for Gypsum Board
 12. C 1658 – Standard Specification for Glass Mat Gypsum Panels
 13. E 84 – Test Method for Surface Burning Characteristics of Building Materials.
 14. E 90 – Standard Test Method for Laboratory Measurement of Airborne-Sound Transmission Loss of Building Partitions.
- C. Gypsum Association:
1. GA 201 – Using Gypsum Board for Walls and Ceilings
 2. GA-203 – Installation of Screw-Type Steel Framing Members to receive Gypsum Board

3. GA 214 – Recommended Levels of Gypsum Board Finish.
 4. GA 216 – Application and Finishing of Gypsum Board.
- D. Intertek Testing Services (Warnock Hersey Listed):
1. WHI – Certification Listings.
- E. South Coast Air Quality Management District:
1. SCAQMD Rule 1168 – Adhesive and Sealant Applications.
- F. Metal Framing Manufacturer’s Association (MFMA) – Guidelines for the Use of Metal Framing.

1.03 SUBMITTALS

- A. Section 01300 – Submittals: Procedures for submittals.
- B. Product Data: Provide data on metal framing, gypsum board, joint tape, joint compound and acoustical insulation.

1.04 SUSTAINABLE DESIGN SUBMITTALS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate:
1. Certify products meet or exceed specified sustainable design requirements.
 2. Materials Resources Certificates:
 - a. Certify recycled material content for recycled content products.
 3. Indoor Air Quality Certificates:
 - a. Certify volatile organic compound content for each interior adhesive and sealant and related primer.
 - b. Certify volatile organic compound content for each ceiling and wall system.

1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with ASTM C840, GA-201, GA-214, GA-216 GA-600 and ASTM C754. Maintain one copy on site.

1.06 PROJECT CONDITIONS

- A. Qualifications:
1. Manufacturer: Company specializing in the manufacturing of Product with minimum 5 years documented experience.
 2. Applicator Qualifications: Company specializing in performing the work of this section with minimum 5 years documented experience.
- B. Coordination:
1. Coordinate with the placement of components within the stud framing systems. See Related Sections.

PART 2 PRODUCTS

2.01 SUSTAINABILITY CHARACTERISTICS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design compliance.
- B. Materials and Resources Characteristics:
 - 1. Recycled Content Materials: Furnish materials with maximum available recycled content.
- C. Indoor Environmental Quality Characteristics:
 - 1. Interior Adhesives: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.
 - 2. Interior Sealants and Sealant Primers: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.

2.02 GYPSUM BOARD SYSTEMS

- A. Manufacturers: One of the following or approved equal
 - 1. CertainTeed.
 - 2. Georgia-Pacific.
 - 3. United States Gypsum.
- B. Materials:
 - 1. Interior Perimeter Wall Gypsum Wall Sheathing Panels:
 - a. CertainTeed Diamondback Glasroc Tile Backer Type X, ASTM C1396 and ASTM C1658; 1/2-inch thick, maximum available size in place; ends square cut;
 - b. Georgia Pacific, equivalent product.
 - c. USG, equivalent product.
 - 2. Interior Gypsum Board (non-Perimeter Walls):
 - a. CertainTeed Type X Drywall, ASTM C1396 and ASTM C1658; 5/8 inch thick, maximum available size in place; ends square cut and tapered.
 - b. Georgia Pacific, equivalent product.
 - c. USG, equivalent product.
 - 3. Moisture Resistant Gypsum Board: ASTM C630/C 1396; 5/8-inch thick, maximum available length in place; ends square cut and tapered.
 - a. CertainTeed Diamondback Glasroc Tile Backer Type X, ASTM C1396 and ASTM C1658; 5/8-inch thick, maximum available size in place; ends square cut and tapered.
 - b. Georgia Pacific, equivalent product.
 - c. USG, equivalent product.
- C. Accessories
 - 1. For each type of wallboard material, use joint materials and accessories recommended by MANUFACTURER for that product.
 - 2. Acoustic Insulation: ASTM C739; cellulose insulation, pneumatically placed.
 - 3. Acoustic Sealant: Non-hardening, non-skinning, for use in conjunction with gypsum board; #808 Acoustical Sealants manufactured by Protective Treatments, or equal.
 - a. Interior Sealants and Sealant Primers: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.

4. Uni-strut supports adequately sized where necessary between structural bar joist, beams, or trusses to support suspended gypsum board systems.
 5. Corner Beads:
 - a. External Corners – Metal; Dur -A-Bead No. 103 by USG, or equal.
 - b. Internal Corners – Metal reinforced tape.
 6. Edge Trim: GA-201 and GA-216; Type 200-A and 200-B by USG or equal.
 7. Corner expansion joint: No. 30 Corner Expansion Joint by Cemco.
 8. Drywall control joints: USG expansion joint type ASTM C1047 No. 093.
 9. Joint Materials: GA-201 and GA-216; reinforcing tape, joint compound, adhesive, and water.
 - a. Interior Adhesives: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.
 10. Powder Texture Product: USG Sheetrock Brand Wall and Ceiling Texture Tuf-TEX.
 11. Fasteners: ASTM C1002, Type S12 W and GA-216.
- D. Stainless Steel Corner Guards:
1. Manufacturer: One of the following or equal:
 - a. IPC Door and Wall Protection Systems, InPro Corporation, Muskego, WI; www.inprocorp.com; Model #: 181124C-430.
 - 1) Material: Stainless steel, Type 430, 16 gauge.
 - 2) Size: 1-1/2 inch legs and 1/8-inch radius. Height of corner guard to be 4 feet 0 inches high from top of base trim.
 - 3) Attachment: Field applied heavy duty adhesive.
 - a) Interior Adhesives: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.
 - 4) Finish: Stainless steel No. 4 satin finish.

2.03 METAL STUD FRAMING

- A. Manufacturers
1. Dietrich – Ultra steel
 2. USG Building Systems.
 3. National Gypsum Corporation.
 4. Dale Incor.
 5. Harrison Manufacturing.
 6. Fire Trak deflection track and firestop system.
- B. Materials
1. Framing System Components: ASTM C645.
 2. Furring, Framing, and Accessories: ASTM A525, ASTM A591: non-load bearing rolled steel, channel-shaped, punched for utility access.
 - a. 1/2 inch – 25 ga., standard duty.
 - b. 7/8 inch – 25 ga., standard duty.
 - c. 1 5/8 inch – 25 ga., standard duty.
 - d. 2 inch – 25 ga., standard duty.
 - e. 3 5/8 inch – 25 ga., standard duty
 - f. 4 inch – 25 ga., standard duty.
 - g. 6 inch – 22 ga., heavy duty.
 - h. 8 inch – 25 ga., standard duty.
 3. Door jambs and headers: 20 ga.
 4. Storage & Closets with Wall attached shelf brackets: 20 ga.

5. Runners: Of same material and thickness of studs, bent leg retainer notched to receive studs.
6. Bracing Members: Of same materials as studs; thickness to suit purpose.
7. Fasteners: GA 203; Self-drilling, self-tapping screws.
8. Anchorage Devices: Type best suited to specific application.
9. Touch-up Primer for Galvanized Surfaces: Zinc rich coating, "ZRC."
10. Finish for Studs, Tracks, Headers and Accessories: Galvanize to G60 coating class.
11. Adhesive: Type best suited to specific application.
 - a. Interior Adhesives: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.

2.04 SUSPENDED GYPSUM FURRING SYSTEMS

- A. Manufacturers
 1. Chicago Metallic Corporation.
 2. National Rolling Mills.
 3. Armstrong.
 4. Or approved equal.
- B. Materials:
 1. Furring Runners and Furring Tees: 0.20-metal thickness, 1-1/2-inch high double web galvanized steel with 1-3/8-inch capped flange face.
 2. Cross Tees: .020-metal thickness, 1 1/2 inch high double web galvanized steel with 15/16-inch capped flange face.
 3. Wall Track: 1-1/2-inch high double web galvanized steel with 15/16 inch top and bottom flange faces.
 4. Metal Studs: As necessary; 24 gauge.
 5. Hanger Wires: 12-gauge galvanized steel.
 6. Recycled Content: Maximum recycled content available from Manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that site conditions are ready to receive work and opening dimensions are as instructed by the Manufacturer.
- C. Verify that rough-in utilities are in place.

3.02 ERECTION – METAL STUD FRAMING SYSTEM

- A. Plumb and secure top and bottom runners at locations indicated on plan. Place two beads of acoustical sealant between runners and substrate to achieve an acoustic seal.
- B. Extend stud framing to above ceiling. Attach ceiling runner securely to framing in accordance with Manufacturer's instructions and as indicated per drawings.

- C. Refer to Drawings for indication of partitions extending stud framing through the ceiling to the structure above. Maintain clearance under structural building members to avoid deflection transfer to studs. Provide extended leg ceiling runners.
- D. Install studs vertically at 16 inches on center unless otherwise directed.
- E. Align stud web openings horizontally.
- F. Secure studs to tracks using fastener method. Do not weld.
- G. Stud splicings are not permissible.
- H. Fabricate corners using a minimum of three studs.
- I. Install double studs at wall openings, door, and window frame jambs not more than two inches from each side openings.
- J. Brace stud framing systems rigid.
- K. Coordinate erection of studs with requirements of door frames, window frames and blocking for surface mounted items. Install supports and attachments.
- L. Coordinate installation of wood bucks, anchors, and wood blocking with electrical and mechanical work to be placed within or behind stud framing.
- M. Blocking: Secure wood blocking to studs. Secure steel channels to studs. Install blocking for support of plumbing fixtures, toilet partitions, wall cabinets, toilet accessories, hardware, multimedia boards, tack boards and signage.
- N. Coordinate placement of insulation in stud spaces made inaccessible after stud framing erection.

3.03 ERECTION – GYPSUM FURRING SYSTEM

- A. Install gypsum furring system in accordance with ASTM C636 and MANUFACTURER's instructions.
- B. Main beams shall be suspended from the overhead construction with not less than 12 ga. galvanized steel hanger wires, spaced 48 inches on center. Cross tees shall be spaced no more than 16 inches on center.
- C. Gypsum board shall be screw attached 8 inches on center to all furring runners, furring tees, cross tees and wall tracks.

3.04 ERECTION – SUSPENDED GYPSUM FURRING SYSTEM

- A. Install in accordance with ASTM C754 and Manufacturer's instructions.
- B. Coordinate location of hangers with other work.
- C. Install ceiling framing independent of walls, columns, and above ceiling work.

- D. Reinforce openings in ceiling suspension system that interrupt main carrying channels or furring channels with lateral channel bracing. Extend bracing minimum 24 inches past each end of openings.
- E. Laterally brace entire suspension system.

3.05 GYPSUM BOARD INSTALLATION

- A. Install all gypsum board materials in accordance with GA-201, GA-216 and GA-600 and in strict accordance with Manufacturer's instructions.
- B. Erect single layer gypsum board vertically, with edges and ends occurring over firm bearing.
- C. Erect exterior gypsum sheathing horizontally, with edges butted tight and ends occurring over firm bearing.
- D. Use screws when fastening gypsum board to metal furring or framing.
- E. Treat cut edges and holes in moisture resistant gypsum board with sealant.
- F. Place control joints consistent with lines of building. Space at maximum of 30 feet both horizontally and vertically, and as shown on drawings.
- G. Place corner beads at external corners. Use longest practical length. Place edge trim where gypsum board abuts dissimilar materials.
- H. Install corner expansion joints at all conditions where drywall meets exterior walls.
- I. Install backing board over metal studs in accordance with Manufacturer's instructions.

3.06 INSTALLATION SCHEDULE – GYPSUM BOARD

- A. Install paperless interior gypsum board on interior face of building perimeter, in toilet rooms and in custodial closet.

3.07 INSTALLATION – CORNER GUARDS

- A. Install corner guard level and plumb where indicated on the Drawings.
- B. Surface must be dry, clean, and properly sealed.
- C. Install according to Manufacturer's surface mount installation instructions.

3.08 JOINT TREATMENT

- A. All joints and interior angles shall have tape embedded in joint compound and three separate coats of joint compound applied over all joints, angles, fastener heads, and accessories.

- B. A thin skim coat of joint compound, or a material manufactured especially for this purpose, shall be applied to the entire gypsum board surface to achieve smooth finish.
- C. Finish surfaces of fur-downs and ceilings shall be smooth and free of tool marks and ridges.
- D. Fill and finish joints and corners of backing board.
- E. All other gypsum wall and ceiling finishes shall be smooth.
- F. All inside corner gypsum assemblies at exterior wall are to use corner expansion joints.

3.09 TOLERANCES

- A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8-inch in 10 feet in any direction.

3.10 SCHEDULE

- A. Interior Paperless Gypsum Panels: Interior side of Building perimeter, Restroom/Shower and Custodian.
- B. Interior standard Gypsum Panels: General Partitions

END OF SECTION

SECTION 09310

CERAMIC TILE

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Thin set ceramic tile for walls and associated materials.

1.02 REFERENCES

- 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. American National Standards Institute (ANSI):
 - 1. A50.3 – Cold-Drawn Steel Wire for Concrete Reinforcement.
 - 2. A108.5 – Ceramic Tile Installed with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar.
 - 3. A108.10 – Installation of Grout in Tilework.
 - 4. A118.4 – Latex-Portland Cement Mortar.
 - 5. A137.1 – Ceramic Tile.
- C. Tile Council of America (TCA) Handbook for Ceramic Tile Installation; Methods:
 - 1. W202 – Walls, Exterior and Interior, Dry-Set Mortar or Latex-Portland Cement Mortar.
 - 2. W243 – Walls, Interior, Wood or Metal Studs, Gypsum Board, Dry-Set Mortar or Latex-Portland Cement Mortar.
 - 3. W244 – Walls, Interior, Cementitious Backer Units, Dry-Set Mortar or Latex Portland Cement Mortar.
- D. South Coast Air Quality Management District:
 - 1. SCAQMD Rule 1168 – Adhesive and Sealant Applications.

1.03 SUBMITTALS

- A. Product Data: Include manufacturer's standard colors.
- B. Color Selection: Submit two sets of full line of manufacturer's colors for each type of tile and grout for selection by Engineer.
- C. Samples: Tile and grout on minimum 24-inch square waterproof boards showing range of Engineer's selected colors.
- D. Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.

1.04 SUSTAINABLE DESIGN SUBMITTALS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design submittals.

- B. Manufacturer's Certificate:
 - 1. Certify products meet or exceed specified sustainable design requirements.
 - 2. Materials Resources Certificates:
 - a. Certify recycled material content for recycled content products.
 - 3. Indoor Air Quality Certificates:
 - a. Certify volatile organic compound content for each interior adhesive and sealant and related primer.
 - b. Certify VOC content for each flooring system.
 - c. Certify VOC content for each ceiling and wall system.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.06 PROJECT CONDITIONS

- A. Pre-Installation Meeting:
 - 1. Section 01400 – Quality Control Services: Pre-installation meeting required.
 - 2. Convene 1 week before starting work of this section.
- B. Environmental Requirements:
 - 1. Do not install adhesives in an unventilated environment.
 - 2. Maintain ambient and substrate temperature of 50 degrees F during installation of mortar materials.
- C. Maintenance:
 - 1. Extra Materials: Minimum 2 percent of each type, size, and color tile installed, but not less than enough to cover 4 square foot area.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Ceramic Tile: All products by the same manufacture. One of following or approved equal:
 - 1. Dal Tile.
 - 2. American Olean.
 - 3. ACME Brick Tile & Stone (formerly American Tile & Stone).
- B. Setting Materials and Grout: One of the following or approved equal:
 - 1. C-Cure.
 - 2. Custom Building Products.
 - 3. Laticrete International, Incorporated.
 - 4. Mapei.
 - 5. Upco Company.

2.02 SUSTAINABILITY CHARACTERISTICS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design compliance.

- B. Materials and Resources Characteristics:
 - 1. Recycled Content Materials: Furnish materials with maximum available recycled content.

- C. Indoor Environmental Quality Characteristics:
 - 1. Interior Adhesives: Maximum VOC content according to SCAQMD Rule 1168.
 - 2. Interior Sealants and Sealant Primers: Maximum VOC content according to SCAQMD Rule 1168.
 - 3. Interior Hard Surface Flooring: FloorScore Certified for VOC content according to SCS EC10.2.
 - 4. Interior Tile Setting Adhesives and Grout: Maximum VOC content according to SCAQMD Rule 1168.

2.03 CERAMIC TILE

- A. Base Tile: Coved, colors as selected by Engineer.

- B. Wall Tile: ANSI A137.1, glazed, colors as selected by Engineer, conforming to the following:
 - 1. Moisture Absorption: 0 to 0.5 percent.
 - 2. Size: 6-by-6-by-5/16.
 - 3. Shape: Square.
 - 4. Edge: Cushioned.
 - 5. Surface Finish: Glazed.
 - 6. Color: As selected from full available range of Dal Tile Price Group 1 and 2 colors for field. Accent colors will be from Dal Tile Price Group 3 and 4 colors. Each area to receive tile will have a field color and a maximum of two accent colors.
 - a. Accents percentage up to 10 percent.
 - 7. Pattern: To be provided by Engineer.
 - 8. Recycled content: highest available from manufacturer.

2.04 RELATED MATERIALS

- A. Mortar: ANSI A118.4 latex-portland cement type.

- B. Grout: ANSI A118.4, latex Portland cement, factory prepared mixes, containing fungus and bacteria inhibiting agents, colors as selected by Engineer.

- C. Expansion Joint Sealant and Backing: Polyurethane, specified in Section 07900 - Joint Sealers.

- D. Gypsum Board: Water-resistant type specified in Section 09260 - Gypsum Board Assemblies.

- E. Interior Adhesives, Sealants and related Primers: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Protect surrounding work from damage.
- B. Verify that wall surfaces to receive ceramic tile are free of coatings, oil, and wax.
- C. Insure that cementitious backer board has been installed in accordance with Section 09260 - Gypsum Board Assemblies and board manufacturer's instructions with taped joints and corners. Cover with skim coat of dry-set mortar to a feather edge.
- D. Prepare substrate surfaces for adhesive installation in accordance with adhesive manufacturer's instructions.
- E. Vacuum clean surfaces and damp clean.

3.02 INSTALLATION

- A. Install in accordance with ANSI A108.5 and A108.10, W202, W244, and B415, and manufacturer's instructions.
- B. Carefully lay out and center tile on each wall or section of wall.
- C. Rub cut tile edges smooth.
- D. Make joints approximately 1/16-inch wide and accurately align.
- E. Lay exposed edges with bullnose cap or edge units.
- F. Lay external corners with bullnose corner units.
- G. Lay vertical internal corners square.
- H. Align coved base and wall joints.
- I. Extend tile into recesses and behind equipment and fixtures to form complete, uninterrupted covering.
- J. Carefully grind and neatly fit tile around fixtures and fittings.
- K. Terminate tile neatly at obstructions, edges, and corners, without disrupting pattern or joint alignment.
- L. Sound tile after setting. Reset hollow sounding tile.
- M. Remove and replace cracked, chipped, and broken tile.
- N. Provide expansion and control joints over those in walls or as otherwise recommended in TCA Handbook.
- O. Allow tile to set for at least 48 hours before grouting.

- P. Clean joints and grout full depth, without voids.
- Q. Tool joints barely concave, nearly flat.
- R. Remove surplus mortar and grout before hardening. Keep faces of tile clean.
- S. Protect tile surfaces from rapid drying by keeping moist for 72 hours minimum after tile installation.

3.03 TOLERANCES

- A. Flatness of Tile Surface: Maximum variance of 1/8 inch from 10 foot straightedge.

3.04 CLEANING AND PROTECTION

- A. Thoroughly clean tile with non-acidic masonry cleaner.
- B. After cleaning, thoroughly wash tile surfaces with clear water. Protect floors with continuous cover of non-staining, waterproof paper. Leave paper in place until final cleaning.
- C. Where stains are not removable by reasonable washings, replace tile.
- D. After completion of installation and just before final inspection, remove protective coverings; inspect floor surface and repair defects, then thoroughly clean, seal and polish.

3.05 SCHEDULE

- A. Refer to Room Finish Schedule and drawings for tile applications.
- B. Ceramic wall tiles will be selected from manufacturer's full line of colors equal to Dal Tile Price 1 and 2 for field, and Price group 3 and 4 for accent. Accent colors will not exceed 10 percent.

END OF SECTION

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SECTION 09511

ACOUSTICAL CEILING PANELS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Lay-in acoustical ceiling panels.

1.02 REFERENCES

- 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. American Society for Testing and Materials (ASTM):
 - 1. C 635 – Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
 - 2. C 636 – Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels
 - 3. C 665 – Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing
 - 4. E84 – Standard Test Method for Surface Burning Characteristics of Building Materials
 - 5. E 119 – Standard Test Methods for Fire Tests of Building Construction and Materials
 - 6. E 580/E 580M – Standard Practice for Application of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Requiring Seismic Restraint.
 - 7. E 1264 – Standard Classification for Acoustical Ceiling Products
- C. Federal Specifications (FS):
 - 1. FS SS-S-118, Class 25.
- D. Green Seal:
 - 1. GS-11 – Product Specific Environmental Requirements.
- E. Intertek Testing Services (Warnock Hersey Listed):
 - 1. WHI – Certification Listings.
- F. Ceilings and Interior Systems Construction Association:
 - 1. CISCA – Acoustical Ceilings: Use and Practice.

1.03 SUBMITTALS

- A. Product Data.
- B. Samples: Include two nominal 12 x 12 inch in size illustrating material and finish of acoustic units.; two samples each, 12 inches long, of suspension system main runner, cross runner, edge trim, and clips.

- C. Manufacturer's Installation instructions.

1.04 SUSTAINABLE DESIGN SUBMITTALS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
 - 1. Materials Resources Certificates:
 - a. Certify recycled material content for recycled content products.
 - 2. Indoor Air Quality Certificates:
 - a. Certify volatile organic compound content for each interior paint and coating.
 - b. Certify volatile organic compound content for each ceiling and wall system.

1.05 QUALITY ASSURANCE

- A. Pre-Installation Conference: Conduct meeting with affected entities to coordinate acoustical ceiling system with other related work.
- B. Conform to CISCA requirements.
- C. Maintain one copy of each document on site.

1.06 PROJECT CONDITIONS

- A. Qualifications:
 - 1. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
 - 2. Installer: Company specializing in performing Work of this section with minimum three years documented experience.
- B. Pre-Installation Meetings:
 - 1. Section 01400 – Quality Control Services: Pre-installation meeting required.
 - 2. Convene minimum one week prior to commencing work of this section.
- C. Environmental Requirements:
 - 1. Install acoustical ceilings when building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead mechanical work is completed, tested, and approved.
 - 2. Permit wet work to dry prior to commencement of installation.
 - 3. Maintain uniform temperatures of minimum 60 degrees Fahrenheit and 20 to 40 percent humidity prior to, during, and after installation.
- D. Extra Materials:
 - 1. One unopened carton of each size and color acoustical panel installed.

PART 2 PRODUCTS

2.01 SUSTAINABILITY CHARACTERISTICS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design compliance.
- B. Materials and Resources Characteristics:
 - 1. Recycled Content Materials: Furnish materials with maximum available recycled content.

2.02 LAY-IN ACOUSTICAL PANELS

- A. Manufacturers: One of the following or equal:
 - 1. Armstrong World Industries, Inc; Cirrus 589HRC
 - 2. USG Interiors; Millennia ClimaPlus FLB
 - 3. CetainTeed, Cashmere CM-450
- B. Type: FS SS-S-118, Class 25, with following characteristics:
 - 1. Material: Fire-retardant mineral board.
 - 2. Style: Cirrus.
 - 3. Face Size: 24 by 24 inches.
 - 4. Thickness: 5/8 inch.
 - 5. Edges: Beveled Tegular.
 - 6. Finish: Factory-applied latex paint; white.
 - 7. NRC Range: 0.70 for Number 7 mounting.
 - 8. Light Reflectance: 86 percent.
 - 9. Recycled content: highest available from manufacturer.

2.03 SUSPENDED ACOUSTICAL CEILING GRID

- A. Manufacturers: One of the following or equal:
 - 1. Armstrong World Industries, Inc; Suprafine XL 9/16" Exposed Tee System
 - 2. USG Interiors; Centricitee DXT/DXLT
 - 3. CetainTeed, 6/16" Grid
- B. Grid conforming to the following:
 - 1. Non-fire Rated Grid: ASTM C635, exposed T; components die cut and interlocking.
 - 2. Grid Materials: Hot dipped galvanized steel.
 - 3. Exposed Grid Surface Width: 9/16 inch.
 - 4. Grid Finish: White.
 - 5. Accessories: Stabilizer bars, clips, splices, perimeter moldings, and hold down clips required for suspended grid system.
 - 6. Support Channels and Hangers: Galvanized steel; size and type to suit application, and ceiling system flatness requirement specified.
 - 7. Recycled content: highest available from manufacturer.

2.04 ACCESSORIES

- A. Escutcheons: Metal with thickness and finish to match ceiling grid.

- B. Touch-up Paint: Type and color to match acoustic and grid units.
 - 1. Interior Flat and Non-Flat Paints: Maximum volatile organic compound content in accordance with GS-11.
- C. Hanger Wire: Galvanized carbon steel, soft temper, pre-stretched, yield stress load at least three times design load but not less than 12 gauge.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Inspect locations to receive acoustical suspension system and check existing dimensions.
- B. Verify layout of hangers will not interfere with other work.
- C. Verify completion of construction above suspension system, including inspections, enclosure of building, and proper installation of suspension system.
- D. Protect finished construction.

3.02 PREPARATION

- A. Broom clean area and remove obstructions for free movement of scaffolding.
- B. Protect floor surfaces from damage by scaffolding.

3.03 INSTALLATION

- A. Lay-In Grid Suspension System:
 - 1. Install suspension system in accordance with ASTM C636 and as supplemented in this section.
 - 2. Install system capable of supporting imposed loads to deflection of 1/360 maximum.
 - 3. Locate system on room axis according to reflected plan.
 - 4. Install after major above ceiling work is complete. Coordinate location of hangers with other work.
 - 5. Install hanger clips during steel deck erection. Install additional hangers and inserts as required.
 - 6. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
 - 7. Where ducts or other equipment prevent regular spacing of hangers, reinforce nearest affected hangers and related carrying channels to span extra distance.
 - 8. Do not support components on main runners or cross runners when weight causes total dead load to exceed deflection capability. Support fixture loads by supplementary hangers located within 6 inches of each corner; or support components independently.
 - 9. Do not eccentrically load system, or produce rotation of runners.

10. Perimeter Molding:
 - a. Fasten trim to framing with fasteners at spacing as recommended by trim manufacturer
 - b. Install trim true and flush with adjacent surfaces.
 - c. Install splice plates at joints in trim to maintain alignment and produce a hairline joint.

B. Lay-In Acoustical Ceiling Tile:

1. Neatly cut panels to fit spaces so panel edges are supported by suspension system.
2. Install lay-in panels level, in uniform plane without twists, warps, or dents.
3. Leave no visible gaps or openings. Discard panels with cracks or chipped edges.
4. Leave no scrap above ceiling.
5. Install panels with apparent grain running in same direction.
6. Install escutcheons around openings for pipes, supports, and ducts through ceiling.
7. Install hold-down clips on panels within 20 feet of exterior doors.

3.04 ERECTION TOLERANCES

- A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

3.05 CLEANING

- A. Clean dirty and discolored exposed surfaces of panels in accordance with manufacturer's instructions.
- B. Remove damaged panels that cannot be properly cleaned and replace with acceptable panels.

3.06 SCHEDULES

- A. Refer to the Room Finish Schedule and the reflected ceiling plans in Drawings.

END OF SECTION

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SECTION 09650
RESILIENT FLOORING

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Rubber base.

1.02 REFERENCES

- 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
 - 1. E84 - Surface Burning Characteristics of Building Materials.
- C. Federal Specification Unit:
 - 1. FS L-F-475 - Floor Covering Vinyl, Surface (Tile and Roll), with Backing.
 - 2. FS RR-T-650 - Treads, Metallic and Nonmetallic, Skid Resistant.
- D. South Coast Air Quality Management District (SCAQMD):
 - 1. SCAQMD Rule 1168 - Adhesive and Sealant Applications.

1.03 SUBMITTALS

- A. Submit shop drawings and Product Data under provisions of Section 01300 - Submittals.
- B. Provide product data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available.
- C. Submit two sample selector boxes, illustrating manufacturer's full line of colors and patterns.
- D. Submit two sample selectors of base material and edge strips specified.
- E. Submit manufacturer's installation instructions under provisions of Section 01300 - Submittals.

1.04 SUSTAINABLE DESIGN SUBMITTALS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
 - 1. Materials Resources Certificates:
 - a. Certify recycled material content for recycled content products.

2. Indoor Air Quality Certificates:
 - a. Certify volatile organic compound content for each interior adhesive and sealant and related primer.
 - b. Certify volatile organic compound content for each flooring system.

1.05 DELIVERY, STORAGE, AND PROTECTION

- A. Section 01600 –Product Requirements: Transport, handle, store, and protect products.

1.06 PROJECT CONDITIONS

- A. Operation and Maintenance Data:
 1. Submit maintenance procedures and recommended maintenance materials for each product.
- B. Environmental Requirements:
 1. Maintain temperature in storage area between 55 degrees Fahrenheit and 90 degrees Fahrenheit
 2. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees Fahrenheit to achieve temperature stability. Thereafter, maintain conditions above 55 degrees Fahrenheit.

PART 2 PRODUCTS

2.01 SUSTAINABILITY CHARACTERISTICS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design compliance.
- B. Materials and Resources Characteristics:
 1. Recycled Content Materials: Furnish materials with maximum available recycled content.
- C. Indoor Environmental Quality Characteristics:
 1. Interior Adhesives: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.
 2. Interior Hard Surface Flooring: FloorScore Certified for VOC content in accordance with SCS EC10.2.
 3. Interior Concrete, Wood, Bamboo, and Cork Floor Finishes: Maximum volatile organic compound content in accordance with SCAQMD Rule 1113, including sealers and stains.

2.02 MANUFACTURERS

- A. Rubber Base
 1. Johnsonite; Traditional Rubber Wall Base.
 2. Burke; equivalent product.
 3. Roppe Corporation; equivalent product.
 4. Nora, equivalent product.
 5. Or approved equal.

2.03 MATERIALS

- A. Rubber Base Material: roll stock to meet the following criteria:
 - 1. Fed. Specs.: SS-W-40A.
 - 2. Type: 1, Rubber.
 - 3. Height: 4 inch.
 - 4. Gauge: 1/8 inch.
 - 5. Top profile: coved.
 - 6. Color: Color to be selected by Architect.
 - 7. Base Accessories: to be same material size and color of base.
 - a. Pre-molded end stops.
 - b. Pre-molded external corners.

2.04 ACCESSORIES

- A. Primers and Adhesives: Waterproof; types recommended by flooring manufacturer.
 - 1. Interior Adhesives: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are free of substances that may impair adhesion of new adhesive and finish materials.

3.02 PREPARATION

- A. Vacuum clean substrate.
- B. Apply primer as recommended by manufacturer.

3.03 INSTALLATION - BASE

- A. Fit joints tightly and make vertical.
- B. Miter internal corners. At external corners, use pre-molded units. At exposed ends, use pre-molded units.
- C. Install base on solid backing. Bond tightly to wall and floor surfaces.
- D. Scribe and fit to door frames and other interruptions.

3.04 PROTECTION

- A. Protect newly installed wall base for 48 hours after installation.

3.05 CLEANING

- A. Remove excess adhesive from floor, base, and wall surfaces without damage.
- B. Clean, seal, and wax resilient flooring products in accordance with manufacturer's instructions.

3.06 SCHEDULE

- A. Refer to Contract Drawings and to Room Finish Schedule for locations of specified materials.

END OF SECTION

SECTION 09670

FLUID-APPLIED FLOORING

PART 1 GENERAL

1.01 SUMMARY

- A. Furnish and apply, as specified herein, fluid-applied flooring for the Restroom/Shower rooms at Administration Building (90).

1.02 RELATED SECTIONS

- A. Section 410S – Concrete Structures: Prepared concrete floors ready to receive finish; control and formed expansion and contraction joints and joint devices, and concrete curing.
- B. Section 03350 – Concrete Finishing: Termination edging of adjacent floor finish.
- C. Section 03550 – Polished Concrete Finishing: Termination edging of adjacent floor finish.
- D. Section 07900 - Joint Sealers.

1.03 REFERENCES

- A. The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by basic designation only.
- B. ASTM International:
 - 1. ASTM C1028 – Standard Test Method for Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method.
 - 2. ASTM D522 - Standard Test Methods for Mandrel Bend Test of Attached Organic Coatings.
 - 3. ASTM D2794 - Standard Test Method for Resistance of Organic Coating to the Effects of Rapid Deformation (Impact).
 - 4. ASTM D3363 - Standard Test Method for Film Hardness by Pencil Test.
 - 5. ASTM D4060 - Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser.
 - 6. ASTM D4541 - Standard Test Method for Pull Off Strength of Coatings Using Portable Adhesion Testers.
 - 7. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials.
- C. South Coast Air Quality Management District:
 - 1. SCAQMD Rule 1113 – Architectural Coatings Applications.

1.04 SUBMITTALS

- A. Submit the following in accordance with Specification Section 01300 - Submittals.

- B. Product Data: Submit data on specified products, describing physical and performance characteristics; sizes, patterns and colors available.
- C. Manufacturer's Certificate: Certify products meet or exceed specified requirements.
- D. Manufacturer's Installation Instructions: Submit special procedures, perimeter conditions requiring special attention.

1.05 SUSTAINABLE DESIGN SUBMITTALS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
 - 1. Materials Resources Certificates:
 - a. Certify recycled material content for recycled content products.
 - 2. Indoor Air Quality Certificates:
 - a. Certify volatile organic compound content for each interior adhesive and sealant and related primer.

1.06 CLOSEOUT SUBMITTALS

- A. Section 01700 – Contract Closeout: Closeout procedures.
- B. Operation and Maintenance Data: Submit maintenance procedures, recommended maintenance materials, procedures for stain removal, repairing surface, and suggested schedule for cleaning.

1.07 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years' experience.
- B. Installer: Company specializing in performing work of this section with minimum three years documented experience

1.08 DELIVERY, STORAGE AND HANDLING

- A. Section 01600 - Product Requirements: Product storage and handling requirements.
- B. Store resin materials in dry, secure area.
- C. Store materials for three days prior to installation in area of installation to achieve temperature stability.

1.09 ENVIRONMENTAL REQUIREMENTS

- A. Section 01600 - Product Requirements.
- B. Maintain minimum temperature in storage area of 50 degrees F.

- C. Maintain ambient temperature required by manufacturer 72 hours prior to, during, and 48 hours after installation of materials.

PART 2 PRODUCTS

2.01 SUSTAINABILITY CHARACTERISTICS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design compliance.
- B. Materials and Resources Characteristics:
 - 1. Recycled Content Materials: Furnish materials with maximum available recycled content.
- C. Indoor Environmental Quality Characteristics:
 - 1. Interior Concrete: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.

2.02 FLUID-APPLIED FLOORING

- A. Manufacturers:
 - 1. H&C Water-Based Polyurethane 2-Part Clear Coat with H&C SHARKGRIP Slip-Resistant additive as basis of design.
- B. Substitutions: Section 01600 - Product Requirements.

2.03 COMPONENTS

- A. Fluid-Applied Flooring: Water-based polyurethane, two component.
 - 1. Breathable aliphatic urethane designed for use over concrete substrates.
- B. Anti-Slip Additive: mix-in additive.
 - 1. Micronized polymer, add to mix of second coat of polyurethane clear coat.
- C. Colors:
 - 1. Clear.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Section 01400 – Quality Control Services: Coordination and project conditions.
- B. Verify floor surfaces are smooth and flat with maximum variation and are ready to receive work.
- C. Verify concrete floors have cured minimum 28 days, exhibit negative alkalinity, carbonization, and dusting, and are acceptable to flooring manufacturer.
- D. Verify floor wall surfaces are free of substances capable of impairing adhesion of adhesive and finish materials.

3.02 PREPARATION

- A. Prepare surfaces as required by manufacturer.
- B. Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes, and other defects with sub-floor filler.
- C. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Grind irregularities above surface level. Prohibit traffic until filler is cured.
- D. Clean substrate.
- E. Apply primer as required to prevent "bleed-thru" or interference with adhesion by substances that cannot be removed.

3.03 INSTALLATION

- A. Apply each coat of flooring within thickness range required by manufacturer.
 - 1. Apply base coat of 2-part polyurethane.
 - 2. Apply finish coat of 2-part polyurethane with anti-slip additive mixed in thoroughly.
- B. Finish to smooth surface.

3.04 PROTECTION

- A. Section 01600 – Product Requirements: Protecting installed construction.
- B. Prohibit traffic on floor finish until cured.
- C. Barricade area to protect flooring until cured

3.05 SCHEDULES

- A. RESTROOM/SHOWER 108: Portion of floor where shower, bench, urinal and toilet are located as designated on plans.
- B. RESTROOM/SHOWER 109: Portion of floor where shower, bench, urinal and toilet are located as designated on plans.

END OF SECTION

SECTION 09800
SHEET PILING COATING

PART 1 GENERAL

1.01 SUMMARY

- A. This Section includes the furnishing all labor, equipment, and materials, and performing all operations necessary for coating of all interior and exterior surfaces of the entire length of all sheet piles and accessories.

1.02 RELATED REQUIREMENTS

- A. Review installation procedures under other Sections and coordinate with the work related to this Section.
- B. Related work as called for on PLANS or specified in Specification Section 03160, "Steel Sheet Piling".

1.03 REFERENCES

- A. Without limiting the general aspects of other requirements of these specifications, all surface preparation, coating and painting of interior and exterior surfaces and inspection shall conform to the applicable requirements of SSPC (Society for Protective Coatings), NACE (National Association of Corrosion Engineers) International, ASTM (American Society for Testing and Materials), AWWA (American Water Works Association) and the manufacturer's printed instructions.
- B. 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.
 - 1. American Society for Testing and Materials (ASTM):
 - a. ASTM D520: Standard Specification for Zinc Dust Pigment
 - b. ASTM D4417: Standard Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel
 - c. ASTM E337: Standard Practice Test Method for Measuring Humidity with a Psychrometer
 - d. ASTM D2200: Standard Methods of Evaluating Degree of Rusting on Painted Surfaces
 - 2. American National Standards Institute (ANSI)
 - a. ANSI/ASC 29.4 Exhaust Systems: Abrasive Blasting Operations – Ventilation and Safe Practice
 - 3. Consumer Product Safety Act, Part 1303
 - 4. NACE International
 - a. NACE Publication TPC2: Coatings and Linings for Immersion Service: Chapter 1 – Safety, Chapter 2 – Surface Preparation, Chapter 3 – Curing, and Chapter 4 – Inspection
 - b. NACE Standard SP0178: Standard Recommended Practice – Fabrication Details, Surface Finish Requirements and Proper Design Considerations for Tanks and Vessels to be lined for Immersion Service

- c. NACE Standard SP0188: Standard Recommended Practice – Discontinuity (Holiday) Testing of Protective Coatings
- d. NACE Standard RP0287: Field Measurement of Surface Profile of Abrasive Blast-Cleaned Steel Surfaces Using a Replica Tape
- 5. Occupational Safety and Health Administration (OSHA)
 - a. 1915.35: Standards – 29 CFR – Painting
- 6. Society for Protective Coatings (SSPC)
 - a. SSPC-SP2: Hand Tool Cleaning
 - b. SSPC-SP3: Power Tool Cleaning
 - c. SSPC-SP13: Surface Preparation of Concrete
 - d. SSPC-PA-1: Shop, Field and Maintenance Painting
 - e. SSPC-PA-2: Measurement of Dry Film Thickness with Magnetic Gages
 - f. SSPC-PA-3: Guide to Safety in Paint Application
 - g. SSPC-Guide 12: Guide for Illumination of Industrial Painting Project
 - h. SSPC-VIS 1-89: Pictorial Surface Preparation Standards for Painting Steel Surfaces
 - i. SSPC Paint Spec 36: Two-Component Weatherable Aliphatic Polyurethane Topcoat, Performance-Based
- 7. SSPC/NACE Joint Standards
 - a. SSPC-SP5/NACE 1: White Metal Blast Cleaning
 - b. SSPC-SP6/NACE 3: Commercial Blast Cleaning
 - c. SSPC-SP7/NACE 4: Brush-Off Blast Cleaning
 - d. SSPC-SP10/NACE 2: Near-White Metal Blast Cleaning
- 8. National Association of Pipe Fabricators (NAPF)
 - a. NAPF 500-03-01: Solvent Cleaning
 - b. NAPF 500-03-04: Abrasive Blast Cleaning for Ductile Iron Pipe
 - c. NAPF 500-03-05: Abrasive Blast Cleaning for Cast Ductile Iron Fittings

C. The decision of the Owner shall be final as the interpretation and/or conflict between any of the referenced specifications and standards contained herein.

1.04 SUBMITTALS

- A. Furnish in accordance with Specifications Section 01300, “Submittals” and Section 01730, “Operation and Maintenance Data”.
 - 1. Shop Drawings. In addition to the items specified in Specification Section 01300, “Submittals”, furnish the following:
 - a. Submit descriptive literature and product information of all proposed coatings.
 - b. Submit list indicating major items to be painted, preparation, paint manufacturer, product designation, and dry mil thickness.
 - c. Submit manufacturer’s printed instruction describing surface preparation procedures and application procedures including environmental limits (temperature and humidity).
 - d. Material Safety Data Sheets (MSDS) for all coatings, solvents, sealers, and paints to be utilized.
 - e. Submit written statement by the coating manufacturer stating that the Contractor is familiar with the materials specified and has workers capable of performing the work specified herein.

1.05 QUALITY ASSURANCE

- A. General:
1. Quality assurance procedures and practices shall be utilized to monitor all phases of surface preparation, application and inspection throughout the duration of the project. Procedures or practices not specifically defined herein may be utilized provided they meet recognized and accepted professional standards and are approved by Owner.
 2. The coating Contractor shall have a minimum of three years practical experience and successful history in the application of specified products to similar surfaces at water or wastewater treatment plants. Upon request, coating Contractor shall substantiate this requirement by furnishing a list of references and job completions.
 3. The personnel performing the work shall be knowledgeable and have the required experience and skill to adequately perform the work for this project, in accordance with SSPC-PA1, "Shop, Field and Maintenance Painting".
- B. Surface Preparation: Surface preparation will be based upon comparison with: "Pictorial Surface Preparation Standards for Painting Steel Surfaces: SSPC-VIS 1-89", ASTM Designation D2200-95, "Standard Methods of Evaluating Degree of Rusting on Painted Surfaces", ASTM D 4417-91, Method A and/or Method C or NACE Standard RP0287-87, and ASTM Designation D610 "Visual Standard for Surfaces of New Steel Air blast Cleaned with Sand Abrasive". In all cases the written standard shall take precedence over the visual standard. In addition, NACE Standard SP0178, along with the Visual Comparator, shall be used to verify the surface preparation of welds.
- C. Application: No coating or paint shall be applied when: 1) the surrounding air temperature or the temperature of the surface to be coated or painted is below the minimum surface temperature for the products specified herein, 2) rain, snow, fog or mist is present, 3) the temperature is less than 5 deg F above the dew point, 4) the air temperature is expected to drop below the minimum temperature for the products specified within six hours after application of coating. Dew point shall be measured by use of an instrument such as a Sling Psychrometer in conjunction with U.S. Department of Commerce Weather Bureau Psychrometric Tables. If any of the above conditions are prevalent, coating or painting shall be delayed or postponed until conditions are favorable. The day's coating or painting shall be completed in time to permit the film sufficient drying time prior to damage by atmospheric conditions.
- D. Coating Thickness: Thickness of coatings and paint shall be measured and checked according to the procedures outlined in SSPC-PA 2 "Measurement of Dry Film Thickness with Magnetic Gages", May 2012 Edition. Dry film thickness shall be a Level 2 as defined in Paragraph 9.2, excepting that no single gage reading shall be less than 80% of the specified dry film thickness. Areas that fail to meet these criteria shall be corrected at no expense to the Owner. Use of an instrument such as a Tooke Gauge, precision groove grinder, etc. is permitted if a destructive test is deemed necessary by the Owner.
- E. Holiday (Pinhole) Testing: The integrity of coated surfaces scheduled for immersion shall be tested for holidays in accordance with NACE Standard SP0188. For dry films less than 20 mils, a non-destructive holiday detector shall not exceed

67.5 volts, nor shall destructive holiday detector exceed the voltage recommended by the manufacturer of the coating system. A solution of 1-ounce non-sudsing type wetting agent, such as Kodak Photo-Flo, and 1 gallon of tap water shall be used to perform the holiday testing. For coating thickness at 20 mils and greater, a high voltage Tinker & Rasor AP/W holiday tester shall be used. Contact coating manufacturer for voltage recommendations and curing parameters.

All pinholes and/or holidays shall be marked and repaired in accordance with the manufacturer's printed recommendations and retested. No pinholes or other irregularities will be permitted in the final coating.

- F. Inspection Devices: The contractor shall furnish, until final acceptance of coating and painting is accepted, inspection devices in good working condition for detection of holidays and measurement of dry film thickness of coating and paint. The Contractor shall also furnish U.S. Department of Commerce, National Bureau of Standards certified thickness calibration plates and/or plastic shims, depending upon the thickness gauge used, to test the accuracy of dry film thickness gauges and certified instrumentation to test the accuracy of holiday detectors. Dry film gauges and holiday detectors shall be made available for the Owner's use at all times until final acceptance of application. Holiday detection devices shall be operated in the presence of the Owner.
- G. Inspection: Inspection for this project shall consist of 'hold point' inspections. The Owner or its representative shall inspect the surface prior to abrasive blasting, after abrasive blasting but prior to application of coating materials, and between subsequent coats of material. Final inspection shall take place after all coatings are applied, but prior to sheet pile installation. Contractor will ensure that sufficient rigging is in place so that the Owner or its representative shall be able to conduct the required inspections.
- H. Warranty Inspection: Warranty inspection shall be conducted during the eleventh month following acceptance of all coating and painting work. All defective work shall be repaired in accordance with this specification and to the satisfaction of the Owner.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Delivery:
 - 1. Materials shall be delivered to the site in an undamaged condition and at such intervals as will avoid delay in the work.
 - 2. All materials shall be brought to the jobsite in original sealed containers. They shall not be used until the Owner or Owner's representative has inspected the contents and obtained data from information on containers or label. Materials exceeding storage life recommended by the manufacturer shall be rejected.
- B. Storage:
 - 1. Materials shall be stored and protected in a clean, properly drained location. Materials shall be kept off the ground under a weather-tight covering.
 - 2. All coatings and paints shall be stored in enclosed structures to protect them from weather and excessive heat or cold. Flammable coatings and paints must be stored to conform with City, County, State and Federal safety codes for flammable coating or paint materials. At all times coatings and paints shall be protected from freezing.

1.07 SAFETY AND HEALTH REQUIREMENTS

- A. General: In accordance with requirements set forth by regulatory agencies applicable to the construction industry and manufacturer's printed instructions and appropriate technical bulletins and manuals, the Contractor shall provide and require use of personal protective lifesaving equipment for persons working on or about the project site.
- B. Head and Face Protection and Respiratory Devices: Equipment shall include protective helmets, which shall be worn by all persons while in the vicinity of the work. In addition, workers engaged in or near the work site during sandblasting shall wear eye and face protection devices and air purifying, half-mask or mouthpiece respirators with appropriate filters. Barrier creams shall be used on any exposed areas of skin.
- C. Ventilation: Where ventilation is used to control hazardous exposure, all equipment shall be explosion-proof. Ventilation shall reduce the concentration of air contaminants to the degree a hazard does not exist. Air circulation and exhausting of solvent vapors shall be continued until coatings have fully cured.
- D. Sound Levels: Whenever the occupational noise exposure exceed maximum allowable sound levels, the Contractor shall provide and require the use of approved ear protective devices.
- E. Illumination: Adequate illumination shall be provided while work is in progress, including explosion-proof lights and electrical equipment. Whenever required by the Owner, the Contractor shall provide additional illumination and necessary supports to cover all areas to be inspected. The Owner and/or Inspector shall determine the level of illumination.
- F. Temporary Ladders and Scaffolding: All temporary ladders and scaffolding shall conform to applicable safety requirements. They shall be erected where requested by the Owner to facilitate inspection and be moved by the Contractor to locations requested by the Owner.

PART 2 PRODUCTS

2.01 MANUFACTURER(S)

- A. Tnemec Company, Inc.
- B. Or Owner/Engineer approved equal
- C. Materials specified are those that have been evaluated for the specific service. Products of the Tnemec Company, Inc. are listed to establish a standard of quality. Equivalent materials of other manufacturer's may be submitted on written approval of the Owner. As part of the proof of equality, the Owner will require at the cost of the Contractor, certified test reports from a nationally known, reputable and independent testing laboratory conducting comparative tests as directed by the Owner between the product specified and the requested substitution.

- D. Requests for substitution shall include manufacturer's literature for each product giving name, product number, generic type, descriptive information, solids by volume, recommended dry film thickness and certified lab test reports showing results to equal the performance criteria of the products specified herein. In addition, a list of five projects shall be submitted in which each product has been used and rendered satisfactory service.
- E. All requests for product substitution shall be made in accordance with contract Specification Section 01300, "Submittals".

2.02 MATERIALS AND/OR EQUIPMENT

- A. All materials shall be lead-free (0.009%) as defined by the Consumer Product Safety Act, Part 1303.
- B. All zinc dust pigment contained in any zinc-rich material shall meet the requirements of ASTM D 520 Type III as regards zinc content and purity.
- C. Organic Zinc-Rich Primer shall have the following physical properties:
 - 1. Test Method: ASTM G 85 Prohesion: No blistering, cracking, or delamination of film. No more than 1/64" rust creepage at the scribe after 5,000 hours.
 - 2. Test Method: ASTM B 117 Salt Fog: No blistering, cracking, or delamination of film. No more than 1% rusting on the surface after 20,000 hours.
- D. Coal Tar Epoxy or Polyurethane Tar shall have the following physical properties:
 - 1. Test Method: ASTM D 4541 Adhesion: Not less than 1150 psi pull.
 - 2. Test Method: ASTM B 117 Salt Fog: No rusting, blistering or delamination on plane after 9,000 hours. (ASTM B 117).

2.03 MATERIAL PREPARATION

- A. Mix and thin materials according to manufacturer's latest printed instructions.
- B. Do not use materials beyond manufacturer's recommended shelf life.
- C. Do not use mixed materials beyond manufacturer's recommended pot life.
- D. Do not split kits of multi-component products.

2.04 COATING SCHEDULE

- A. The number of coats called for in this schedule shall be considered minimum. If more coats are required for complete coverage and uniform appearance, they shall be applied.
- B. Shop Application
 - 1. Surface Preparation Prior to Abrasive Blast Cleaning: Weld flux and spatter shall be removed by power tool cleaning. Sharp projections shall be ground to a smooth contour. All welds shall be ground to a smooth contour as per NACE Standard SP0178, Designation D.
 - 2. Surface Preparation: SSPC-SP10 Near-White Metal Blast Cleaning. Anchor profile shall be angular with a 2.0 mil profile as per ASTM D 4417, Method C or NACE Standard RP0287.

3. Coating System:

First Coat: Tnemec Series 90G-1K97 Tneme-Zinc applied at 2.5 to 3.5 dry mils
Stripe Coat: Tnemec Series 66HS Hi-Build Epoxoline applied by brush to all weld seams, edges, corners, nuts, bolts, etc.
Second Coat: Tnemec Series 46H-413 Hi-Build Tneme-Tar applied at 16.0 to 20.0 dry mils
Total minimum dry film thickness shall be 19.0 mils.

C. Field Touch-Up of Shop Painted Steel

1. Surface Preparation: Spot abrasive blast all failed areas in accordance with SSPC-SP10. Feather-edge the remaining intact coatings with the failed areas to create a smooth transition. Uniformly brush blast a 1 foot halo around the failed area to properly degloss and profile in accordance with SSPC-SP7.

2. Coating System:

Spot Prime: Tnemec Series 90G-1K97 Tneme-Zinc applied at 2.5 to 3.5 dry mils
Spot Coat: Tnemec Series 46H-413 Hi-Build Tneme-Tar applied at 16.0 to 20.0 dry mils
Total minimum dry film thickness of the touch-up shall be 19.0 mils.

PART 3 EXECUTION

3.01 GENERAL

- A. All surface preparation, coating and painting shall conform to applicable standards of the Society for Protective Coatings, and the manufacturer's printed instructions. Material applied prior to approval of the surface by the Owner, shall be removed and re-applied to the satisfaction of the Owner at the expense of the Contractor.
- B. All work shall be performed by skilled craftsmen qualified to perform the required work in a manner comparable with the best standards of practice. Continuity of personnel shall be maintained and transfers of key personnel shall be coordinated with the Owner.
- C. The Contractor shall provide a supervisor at the work site during cleaning and application operations. The supervisor shall have the authority to sign change orders, coordinate work and make decisions pertaining to the fulfillment of the contract.
- D. Dust, dirt, oil, grease or any foreign matter that will affect the adhesion or durability of the finish must be removed by washing with clean rags dipped in an approved cleaning solvent and wiped dry with clean rags.
- E. Coating and painting systems include surface preparation, prime coating and finish coatings. Prime and/or coatings, which are damaged during transportation, construction or installation shall be thoroughly cleaned and touched up in the field as directed by the Owner. The Contractor shall use repair procedures, which ensure the complete protection of all adjacent coatings. The specified repair method and equipment may include wirebrushing, hand or power tool cleaning or

dry air blast cleaning. In order to prevent injury to surrounding painted areas, blast cleaning may require use of lower air pressure, smaller nozzle and abrasive particle sizes, or shorter blast nozzle distance or uneconomical to touch-up, then the item shall be re-cleaned and coated or painted as directed by the Owner.

- F. The Contractor's coating and painting equipment shall be designed for application of materials specified and shall be maintained in first class working condition. Compressors shall have suitable traps and filters to remove water and oils from the air. The Contractor's equipment shall be subject to approval of the Owner.
- G. Application of the first coat shall follow immediately after surface preparation and cleaning and stripe coat, if applicable, before rust bloom occurs or the same day, whichever is less. Any cleaned areas not receiving first coat within this period shall be re-cleaned prior to application of first coat. Use of dehumidification equipment shall be first reviewed by the Owner prior to deviating from this provision.
- H. Prior to assembly, all surfaces made inaccessible after assembly shall be prepared as specified herein and shall receive the coating or paint system specified.

3.02 SURFACE PREPARATION

- A. The latest version of the following surface preparation specifications of the Society for Protective Coatings shall form a part of this specification:
 - 1. Solvent Cleaning (SSPC-SP1): Removal of oil, grease, soil and other contaminants by use of solvents, emulsions, cleaning compounds, steam cleaning or similar materials and methods, which involve a solvent or cleaning action.
 - 2. Hand Tool Cleaning (SSPC-SP2): Removal of loose rust, loose mil scale and other detrimental foreign matter to degree specified by hand chipping, scraping, sanding and wirebrushing.
 - 3. Power Tool Cleaning (SSPC-SP3): Removal of loose rust, loose mil scale and other detrimental foreign matter to degree specified by hand chipping, scraping, sanding and wirebrushing.
 - 4. White Metal Blast Cleaning (SSPC-SP5/NACE 1): Blast cleaning to a gray-white uniform metallic color until each element of surface area is free of all visible residues.
 - 5. Commercial Blast Cleaning (SSPC-SP6/NACE 3): The removal of all visible oil, grease, dirt, dust, mil scale, rust, paint, oxides, corrosion products and other foreign matter by compressed air nozzle blasting centrifugal wheels or other specified method. Discoloration caused by certain stains shall be limited to no more than 33% of each square inch of surface.
 - 6. Brush-Off Blast Cleaning (SSPC-SP7/NACE 4): Blast cleaning to remove loose rust, loose mil scale and other detrimental foreign matter degree specified.
 - 7. Near White Blast Cleaning (SSPC-SP10/NACE 2): The removal of all visible oil, grease, dirt, dust, mil scale, rust, paint, oxides, corrosion products and other foreign matter by compressed air nozzle blasting, centrifugal wheels or other specified method. Discoloration caused by certain stains shall be limited to no more than 5% of each square inch of surface area.
 - 8. Power Tool Cleaning to Bare Metal (SSPC-SP11): Power tool cleaning to produce a bare metal surface and to retain or produce a minimum 1.0 mil surface profile. This standard is suitable where a roughened, clean, bare

metal surface is required, but where abrasive blasting is not feasible or permissible.

9. Surface Preparation of Concrete (SSPC-SP13/NACE 6): Surface preparation of concrete by mechanical, chemical, or thermal methods prior to the application of bonded protective coating or lining systems.

- B. Slag, weld metal accumulation and spatters not removed by the Fabricator, Erector or Installer shall be removed by chipping and/or grinding. All sharp edges shall be peened, ground or otherwise blunted as required by the Owner. All grinding and finishing of welds, edges, etc. shall be performed prior to solvent cleaning and abrasive blasting. Welds shall be prepared as per NACE Standard SP0178 for all interior and exterior surfaces as specified in Section 2.0. Minimum acceptable level of finish shall be Designation "D" unless specified otherwise.
- C. Field blast cleaning for all surfaces shall be by dry method unless otherwise directed. Blast nozzles shall be venturi-type nozzles with a minimum pressure at the nozzle of 90 psi.
- D. Particle size of abrasives used in blast cleaning shall be that which will produce a 1.5 – 3.0 mil (37.5 microns - 65.0 microns) surface profile or in accordance with recommendations of the manufacturer of the specified coating or paint system to be applied.

If the profile of the blasted steel exceeds the profile specified above, the Contractor shall be required to do one or both of the following:

- 1. Re-blast the surface using a finer aggregate in order to produce the required profile.
 - 2. Apply a thicker prime coat, if possible given the limitations of the products being applied, in order to adequately cover the blast profile.
- E. Abrasive used in blast cleaning operations shall be new, washed, graded and free of contaminants that would interfere with adhesion of coating or paint and shall not be reused unless specifically approved in writing by the Owner.
 - F. During blast cleaning operations, caution shall be exercised to insure that existing coatings or paint are not exposed to abrasion from blast cleaning.
 - G. The Contractor shall keep the area of his/her work and the surrounding environment in a clean condition. He shall not permit blasting materials to accumulate as to constitute a nuisance or hazard to the accomplishment of the work, the operation of the existing facilities or to the surrounding environment.
 - H. Blast cleaned surfaces shall be cleaned prior to application of specified coatings or paint. All surfaces shall be free of dust, dirt, and other residue resulting from the abrasive blasting operation. No coatings or paint shall be applied over damp or moist surfaces.
 - I. All welds not scheduled to be abrasive blasted or finished by grinding or sanding with power tools as per SSPC-SP3 or SP11 shall be neutralized with a suitable chemical compatible with the specified coating or paint.
 - J. Specific Surface Preparation: Surface preparation for the specific systems shall be as noted in Section 2.04 under the specific systems.

3.03 APPLICATION, GENERAL

- A. Coating and paint application shall conform to the requirements of the Society for Protective Coatings Paint Application Specification SSPC-PA1, latest revision, for "Shop, Field and Maintenance Painting", the American Water Works Association and the manufacturer of the coating and paint materials.
- B. Thinning shall be permitted only as recommended by the manufacturer and approved by the Owner.
- C. Each application of coating or paint shall be applied evenly, free of brush marks, sags, runs, with no evidence of poor workmanship. Care shall be exercised to avoid lapping on glass or hardware. Coatings and paints shall be sharply cut to lines. Finished surfaces shall be free from defects or blemishes.
- D. Protective coverings or drop cloths shall be used to protect floors, fixtures, and equipment. Care shall be exercised to prevent coatings or paints from being spattered onto surfaces, which are not to be coated or painted. Surfaces from which materials cannot be removed satisfactorily shall be recoated or repainted as required to produce a finish satisfactory to the Owner.
- E. When two coats of coating or paint are specified, where possible, the first coat shall contain sufficient approved color additives to act as an indicator of coverage or the two coats must be of contrasting color.
- F. Film thickness per coat specified in Section 2.04 is the minimum required. If brush or roller application is deemed necessary, the Contractor shall apply additional coats as to achieve the specified thickness.
- G. All materials shall be applied as specified.

3.04 COATING SYSTEM APPLICATION

- A. After completion of surface preparation as specified for the specific system, materials shall be applied as noted in Section 2.04.
- B. Care shall be taken so as to eliminate overspray and dry spray. Where such conditions are encountered, the surface shall be cleaned of all over spray and dry spray prior to the application of the succeeding coat.
- C. Areas rendered inaccessible after erection shall receive the full coating system prior to erection and/or assembly.
- D. Structures Within One-Half Mile of Coast: Exterior surfaces that have been coated on a previous day shall be rinsed with clean potable water and allowed to dry before applying subsequent coat(s). Cleaned surfaces, which are not coated the day of cleaning shall be re-cleaned prior to applying coatings.

3.05 REPAIRS

- A. After the coating system has been installed and holiday tested, repair pinholes and voids as follows:

1. Abrasive blasting shall be in accordance with SSPC-SP10/NACE No.2 Near White Blast Cleaning obtaining a minimal surface profile as specified herein.
2. Power tool cleaning shall be in accordance with SSPC-SP11 Power Tool Cleaning to Bare Metal. Surface profile shall be angular and not less than the surface profile as specified herein.
3. All edges of remaining sound, tightly adhering coating shall be feathered back (beveled) to create a smooth transition from the substrate to the coating's surface. The coating may be considered tightly adhering if an edge cannot be lifted with a dull putty knife.
4. Install the coating system as specified herein to provide a complete and monolithic system, free of voids and pinholes.

3.06 CLEAN-UP

- A. Upon completion of the work, all staging, scaffolding and containers shall be removed from the site or destroyed in a manner approved by the Owner. Coating or paint spots, oil or stains upon adjacent surfaces shall be removed and the jobsite cleaned. All damage to surfaces resulting from the work of this section shall be cleaned, repaired, or refinished to the satisfaction of the Owner at no cost to the Owner.

3.07 MEASUREMENT AND PAYMENT

- A. No separate measurement or payment for work performed under this Section. Include cost of same in Contract price bid for work of which this is a component part.

END OF SECTION

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SECTION 09902

PAINTING

PART 1 GENERAL

1.01 SUMMARY

- A. Furnish and apply, as specified herein, architectural paint and protective coatings for Substation #1 (85) and the Administration Building (90).

1.02 RELATED SECTIONS

- A. PLANS define special coating requirements.
- B. Related work as called for on PLANS, or in this or other technical Specification Sections.

1.03 REFERENCES

- A. The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by basic designation only.
- B. Steel Structures Painting Council (SSPC):
 1. SSPC SP-1 - Surface Preparation Specification No. 1 - Solvent Cleaning.
 2. SSPC SP-2 - Surface Preparation Specification No. 2 - Hand Tool Cleaning.
 3. SSPC SP-3 - Surface Preparation Specification No. 3 - Power Tool Cleaning.
 4. SSPC SP-5 - Surface Preparation Specification No. 5 - White Metal Blast Cleaning.
 5. SSPC SP-6 - Surface Preparation Specification No. 6 - Commercial Blast Cleaning.
 6. SSPC SP-7 - Surface Preparation Specification No. 7 - Brush-Off Blast Cleaning.
 7. SSPC SP-8 - Surface Preparation Specification No. 8 - Pickling.
 8. SSPC SP-10 - Surface Preparation Specification No. 10 - Near-White Blast Cleaning.
- C. National Association of Corrosion Engineers (NACE):
 1. NACE No. 1 - White Metal Blast Cleaning.
 2. NACE No. 2 - Near-White Blast Cleaning.
 3. NACE No. 3 - Commercial Blast Cleaning.
 4. NACE No. 4 - Brush-Off Blast Cleaning.

1.04 SYSTEM DESCRIPTION

- A. Surfaces receiving coatings include:
 1. Equipment, machinery, and metal surfaces.
 2. Interior surfaces, as noted in room finish schedule.
 3. Concrete surfaces, including concrete blocks (when noted on PLANS).
 4. All cabinet and woodwork. (Stain finish unless otherwise noted.)

5. Paint concealed structural steel and steel joists, after erection of deck and before steel is enclosed.
 6. Procedures and coating systems specified herein are in addition to shop priming and surface treatment specified in other technical Specification Sections.
- B. Unless otherwise noted or shown, the following areas or items do not require coating:
1. Non-ferrous and corrosion-resistant ferrous alloys such as copper, bronze, monel, aluminum, stainless steel, chromium plate, and atmospherically exposed weathering steel, except where:
 - a. Required for electrical insulation between dissimilar metals;
 - b. Aluminum and stainless steel are embedded in concrete or masonry, or aluminum is in contact with concrete or masonry;
 - c. Color coding of equipment and piping is required.
 2. Non-metallic materials such as glass, PVC, porcelain, and fiberglass, except as required for architectural painting or color coding.
 3. Pre-finished electrical and architectural items such as motor control centers, switchboards, switchgear, panelboards, transformers, disconnect switches, panelboards, acoustical tile, cabinets, elevators, building louvers, etc., except when color coding of equipment is required.
 4. Non-submerged electrical conduits attached to unpainted concrete surfaces.
 5. Items specified to be galvanized after fabrication unless specified elsewhere or subject to immersion.
 6. Insulated piping except as required for architectural painting or color coding.

1.05 SUBMITTALS

- A. Submit the following in accordance with Specification Section 01300 - Submittals.
1. Painting Schedule: Submit list indicating major items to be painted, preparation, paint manufacturer, product designation, and dry mil thickness.
 2. Panels
 - a. Submit panels containing samples of proposed paints and coatings. Include three displays of each kind and color of paint used. Panel to be representative of material to be coated.
 - b. Mark panels to indicate respective types of surfaces to which several kinds and colors of paint, stain, and coating are applied.
 3. Samples: If requested by Owner, submit 1/4 pint of each kind of paint or stain proposed for use. Do not deliver materials to site until representative samples (if requested) have been approved.
 4. For all materials, furnish Engineer with two sets of manufacturer's printed instructions describing surface preparation procedures and application procedures including environmental limits (temperature and humidity).
 5. List of five similar projects in accordance with Article 1.07 Paragraph B.1.
 6. Material Safety Data Sheets (MSDS) for all coatings, solvents, sealers, and paints to be utilized.

1.06 SUSTAINABLE DESIGN SUBMITTALS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
 - 1. Materials Resources Certificates:
 - a. Certify recycled material content for recycled content products.
 - 2. Indoor Air Quality Certificates:
 - a. Certify volatile organic compound content for each interior paint and coating.
 - b. Certify volatile organic compound content for each flooring system.

1.07 QUALITY ASSURANCE

- A. Manufacturer: All paints, sealers, and coatings to be manufactured by those firms listed in Table 2. Products of equal quality by other manufacturers will be considered, subject to review of written submittal that includes product data and a detailed paint and coating schedule.
- B. Workmanship:
 - 1. Furnish workers who perform quality work and who are experienced and knowledgeable in the surface preparation and application of coatings. Submit list of five similar projects which have been prepared and coated by the personnel which the Contractor proposes to employ for this project.
 - 2. Submit manufacturer's written instructions on cleaning and coating prior to any surface preparation or coating.
- C. Whenever possible, all coatings should be from single manufacturer. Unless otherwise specified, coating materials for a specific surface or piece of equipment are to be from a single manufacturer.
- D. All coatings provided for use on this project in the field or from equipment suppliers will be in compliance with Federal, State, and local laws, regulations and ordinances related to items such as lead, chromate, carcinogens and volatile organic compounds.

1.08 DELIVERY, STORAGE AND HANDLING

- A. Deliver to site in original, sealed containers with manufacturer's label attached.
- B. Store in a protected area that is heated or cooled to maintain temperature range recommended by manufacturer. Protect all materials from weathering and extreme temperatures.
- C. Waste and any hazardous material remaining at the end of the day to be discarded in accordance with national, state, and local regulations.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Coating manufacturers are listed by generic type and service in Table 2 attached to this Section.

2.02 SUSTAINABILITY CHARACTERISTICS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design compliance.
- B. Materials and Resources Characteristics:
 - 1. Recycled Content Materials: Furnish materials with maximum available recycled content.
- C. Indoor Environmental Quality Characteristics:
 - 1. Interior Flat and Non-Flat Paints: Maximum volatile organic compound content in accordance with GS-11.
 - 2. Interior Anti-Corrosive Paints: Maximum volatile organic compound content in accordance with GC-03.
 - 3. Interior Clear Wood Finishes, Floor Coatings, Stains, Primers, and Shellacs: Maximum volatile organic compound content in accordance with SCAQMD Rule 1113.
 - 4. Interior Concrete, Wood, Bamboo, and Cork Floor Finishes: Maximum volatile organic compound content in accordance with SCAQMD Rule 1113, including sealers and stains.

2.03 MATERIALS

- A. Tables 1 and 2 in this Section include the paint, protective coatings, and sealers for this project. Furnish all such special materials required for the manufacturer's coating systems whether or not included in the Tables.
- B. Products to comply with Federal, State, and local requirements limiting the emission of volatile organic compounds. The maximum volatile organic content of the combination of coating and thinner is not to exceed the following limits (whichever is less):
 - 1. 0.41 pounds per gallon; or 50 grams per liter (for interior applications)
 - 2. The Federal, State or local limit.
- C. Colors:
 - 1. Owner reserves the right to select colors.
 - 2. Submit list of items to be painted and color charts for each type of surface.
 - 3. Formulate with colorants free of lead or lead compounds.
- D. Safety Color Codes: Follow OSHA requirements of 29 CFR, Part 1910.144 for "Safety Color Codes for Marking Physical Hazards." The following general requirements are set forth as a guide.
 - 1. Red: Fire protection equipment, danger signs, and fire exit signs.
 - 2. Orange: Moving or rotating parts of equipment protected by guards, including shafts and couplings, pulleys, and sprockets. (Do not paint wearing surfaces.)

3. Yellow: Caution signs and all physical hazards, including platforms, bollards and walls subject to being struck.

PART 3 EXECUTION

3.01 GENERAL

- A. Use one convenient location for storing and mixing of materials and keep fire extinguisher available in this area as long as location is used for such purpose.
- B. Thinners and Solvents: Use only those thinners and solvents specified in paint formulas of paint being used and mix in proportions recommended by paint manufacturer.
- C. Coverage: As recommended by paint manufacturer and sufficient to obtain minimum mil thickness specified. Do not exceed maximum thickness specified by manufacturer, if applicable. After final coat is applied, check with elecometer or Mikrotest dry film thickness gauge.
- D. Drying Time: Between successive coats, allow drying time as specified by paint manufacturer. Do not apply additional coats until previous coat is completed.
- E. Provide adequate ventilation for proper curing. Keep materials sealed when not in use.
- F. Environmental conditions such as temperature and humidity to be within the ranges recommended by the coating manufacturer.
- G. Finish coats to be smooth, free of brush marks, streaks, laps or pile up of paints, and skipped or missed areas. Finished metal surfaces to be free of voids or pinholes in any coat when tested with a low voltage detector.

3.02 PREPARATION

- A. General:
 1. Perform all preparation and cleaning procedures in strict accordance with paint manufacturer's instructions and as specified for each substrate.
- B. Concrete Surfaces:
 1. Prior to painting, surfaces to be free of all latent matter, burrs, and fins, using one or more of the following methods.
 - a. Remove oil and grease with detergent and thoroughly rinse with fresh water.
 - b. Abrasive blasting may be used only if machinery or other equipment in vicinity of work is adequately protected. Also, avoid settling of dust or grit on freshly painted surfaces.
 - c. Wash concrete surfaces with 10 percent solution of muriatic acid, then wash clean and free of scale, mortar, dust, moisture, and other foreign matter.
 - d. Repair all honeycomb surface defects by coating cleaned honeycombed area with epoxy bonding agent and filling voids with non-shrink grout leaving a smooth uniform concrete surface.

2. If curing compound is used, it must be removed prior to coating.

C. Metal Surfaces:

1. Clean metal surfaces by abrasive blasting in shop as required by Table 1 and leave clean, dry, and ready to receive prime coat. Provide moisture separators to effectively remove all oil and free moisture from air supply. Cleanliness of air to be tested by impinging an abrasive-free air stream onto a white cloth for one minute. If oil or moisture is detected, air source to be shut down and corrected.
2. Remove all dust and abrasives from surfaces by brushing or blowing with clean, dry air. Remove abrasive grit around and between joints of connecting members.
3. Perform field abrasive blasting only if required to correct unsatisfactorily cleaned and shop-primed metal and when approved by Engineer.
4. Removal of Oil and Grease: Remove oil and grease with a solvent approved by coating manufacturer, or by steam combined with detergent (in accordance with SSPC SP-1). Use of gasoline, kerosene, naphtha, or carbon tetrachloride not permitted.
5. Brushing, Scraping, Grinding, and Chipping: In field work, if abrasive blasting is not possible, scrapers, wire brushes, and other suitable grinding or chipping tools may be used (in accordance with SSPC SP-2 or SP-3) for removal of existing paint coatings prior to repainting, or for cleaning, before applying second coats.
6. Surface to be coated on same day as cleaned and before rust bloom occurs. Surfaces which have been cleaned but which have started to show signs of rust or dirt are to be cleaned again prior to coating at no additional expense to Owner.
7. All surfaces to be at least 5 degrees F or higher above the dew point and remain this way when blasting, priming, or coating.

D. Galvanized Surfaces:

1. Clean surface with mineral spirits to remove oil residue.
2. Dry with a clean cloth.

E. Wood Surfaces

1. Clean soiled surfaces in accordance with coating manufacturer's instructions.
2. Sand to a smooth even surface and then dust off.
3. Apply shellac to all knots, pitch and resinous sapwood before priming coat is applied.
4. Fill nail holes, cracks, open joints and other defects with putty after priming coat has dried. Tint putty to match finish color. Sand smooth after putty dries.
5. Apply priming coats to woodwork as soon as practical after woodwork is delivered.
6. Top and bottom edges of all wood doors to be primed and sealed after fitting and before final hanging.

F. Gypsum Wallboard

1. Fill narrow, shallow cracks and small holes with spackling compound.
2. Rake deep, wide cracks and deep holes.
 - a. Dampen with clean water.
 - b. Fill with thin layers of drywall joint compound
3. Allow repairs to dry.
4. Sand smooth. Do not raise nap of paper on wallboard.

3.03 ERECTION, INSTALLATION, AND APPLICATION INSTRUCTIONS

A. General:

1. Do not apply initial coating until moisture content of surface is within limitations recommended by paint manufacturer. Test with moisture meter.
2. Slightly vary the color of successive coats.
3. Sand and dust between each coat to remove defects visible from a distance of 5 feet.
4. Make edges of paint adjoining other materials or colors clean and sharp with no overlapping.
5. Change colors at corner of stop where colors differ between adjoining spaces or rooms and where door frames match wall colors.
6. Do not proceed with field applied painting of shop-coated items until any defective work has been cleaned by sandblasting.

B. Brush Application:

1. Brushes: Use first-quality hog hair or suitable synthetic bristle brushes. Use of horsehair bristle brushes not permitted. Keep brushes clean and free from accumulation of dried paint or dirt, and when brushes for oil or varnish base paints are not in use, keep them suspended in raw linseed oil bath. Clean brushes with proper solvent before reuse.
2. Application: Apply in uniform thickness consistent with specified coverage and with sufficient cross-brushing to ensure filling of surface irregularities. Exercise particular care in painting around bolt heads and nuts and in corners and other restricted spaces.

- #### C. Conventional Spray Application:
- Apply with adjustable air gun equipped with suitable water trap to remove moisture from compressed air, and with paint pot having air driven or mechanical agitator. Adjust width of spray to meet the requirements of the surface being coated with suitable air pressure for the particular type of paint being used. Make frequent checks to ensure correct spreading rate and coating and apply without sags, runs, or "orange peel" effect. Correct all such imperfections. Take special care to cover edges, corners, and bolt heads, without bridging over of paint film.

- #### D. Airless Spray Application:
- Equipment used for airless spray to be designed for, and capable of handling, the volume and pressures necessary to ensure smooth and proper application. Hoses to be specifically designed for the viscosity of the material being sprayed and be of the non-static, self-grounding type. Tips to be properly sized to ensure complete atomization and the spray pattern is to be continuous and free of all fingering effects.

- #### E. Roller Application:
- Proper length nap rollers to be used to ensure a smooth application free of runs, sags, roller marks, or air bubbles. Use longer nap for rougher surfaces when specified on PLANS. Phenolic core lamb's wool type rollers to be used when polyurethanes, epoxies, or other types activated coatings are applied by roller. Standard type rollers to be used on water based and enamel coatings. Rollers to be of sufficient quality to leave finished surfaces free of lint, roller nap, runs, sags, and other imperfections. Roller is not to exceed 24 inches in length.

- F. Metal Surfaces:
1. Shop-prime metal surfaces, if required, prior to delivery to job site.
 2. After delivery and prior to installation, keep all coated metal surfaces clean and free from corrosion. Clean and touch up or repaint damaged areas with additional primer.
 3. After erection or installation of metal work, clean and touch up all rust spots, all places where primer has been rubbed or scraped off, and all bolts and nuts. After previously applied paint has hardened, and when surfaces to receive succeeding coats of paint have been cleaned and dried, apply finish paint in accordance with Tables 1 and 2. Allow 7 days or more, as recommended by coating manufacturer, for curing of final coat for submerged surfaces.
 4. Factory-Finished Equipment: After installation of factory-finished machinery and electrical equipment, check base coats carefully and touch up all damaged surface areas. Do not paint nameplates, serial number bases, chrome, or bronze trim. Clean off any excess paint that impairs convenient removal of covers on gauges, instrumentation, or other equipment fitted with doors or covers.
 5. Factory-Primed Equipment: Delay final field coating to manufacturer's primed equipment until equipment has been installed and is in proper working order in accordance with the applicable Section.
- G. Mixing and Tinting:
1. Deliver paints and enamels ready mixed to job site.
 2. Accomplish job mixing and job tinting only when acceptable to the Engineer.
 3. Mix only in mixing pails placed in suitably sized non-ferrous or oxide resistant metal pails.
 4. Use tinting colors recommended by manufacturer for the specific type of finish.
 5. Multiple-Component Coatings:
 - a. Prepare using all the contents of the container for each component as packaged by the manufacturer.
 - b. No partial batches permitted.
 - c. Do not use multiple component coatings that have been mixed beyond their pot life.
 - d. Provide small quantity kits for touch up painting and for painting small areas.
 - e. Mix only components specified and furnished by coating manufacturer.
 - f. Do not intermix additional components for reasons of color or otherwise, even within the same generic type of coating.

3.04 REPAIR/RESTORATION

- A. Leave all parts of moldings and ornaments clean and true to details with no undue amount of paint in corners and depressions.
- B. Remove all masking products used to protect hardware or built-in work.
- C. Final Cleaning and Touchup:
1. Touch up and restore finish where damaged.
 2. Do not mar surface finish of item being cleaned.
- D. Refinish whole wall where portion of finish has been damaged or is not acceptable.

- E. Damaged Coatings, Pinholes, and Holidays:
 - 1. Feather edges and repair in accordance with recommendations of coating manufacturer.
 - 2. Repair fusion bonded coatings as recommended by original applicator. Applicator to furnish liquid repair kits for this purpose as recommended by the coating manufacturer.
 - 3. Apply finish coats, including touch up and damage-repair coats, in a manner which presents a uniform texture and color-matched appearance.

- F. Unsatisfactory Application:
 - 1. If coating has improper finish color or insufficient film thickness: Clean and top coat surface with specified material to obtain specified color and coverage. Obtain and follow specific surface preparation information for top coating from coating manufacturer.
 - 2. Hand or power sand visible areas of chipped, peeled, or abraded paint, and feather edges. Follow with primer and finish coat in accordance with this Section. Depending on extent of repair and appearance, a finish sanding and top coat may be required.
 - 3. Evidence of runs, sags, bridges, shiners, laps, or other imperfections to be cause for rejection.
 - 4. Repair defects in coating system per written recommendations of coating manufacturer.
 - 5. Leave all staging in place until Engineer has inspected surface or coating. Replace staging removed prior to inspection and approval by Engineer.

3.05 FIELD QUALITY CONTROL

- A. Schedule field operations to avoid settling of dust or grit on freshly painted surfaces, and adequately protect machinery or other equipment in vicinity of abrasive blasting work.
- B. Request review by Owner of first finished room, space, or item, of each color scheme for color, texture, and workmanship.
- C. Use first acceptable room, space or item (as determined by Owner), as project standard for each color scheme.
- D. For spray application, paint an area no smaller than 100 square feet as the project standard.

3.06 CLEANING

- A. During the progress of the work, remove from the project site at the close of each day's work, all oily rags, discarded materials, rubbish, cans, and dispose of in accordance with national, state, and local regulations.
- B. On completion of operations, remove all spots, oil, and stain from all surfaces and leave entire project in clean condition as far as this work is concerned.
- C. Remove from premises all containers and debris resulting from this work and dispose of in accordance with Federal, State and local regulations.
- D. Upon completion of the work remove staging and scaffolding from the site.

3.07 TESTING AND INSPECTION

- A. Contractor is to perform routine quality control testing on each coat to ensure the integrity of the protective coating. At a minimum, the following tests are to be performed.
 - 1. Dry film thickness.
 - 2. Holiday testing.
 - 3. Any additional tests as recommended by coating manufacturer.
- B. Any and all testing performed by the Engineer is for the sole purpose of verifying compliance with this specification. Contractor is not to rely upon testing performed by the Engineer as a means of quality control.
- C. Contractor to provide the following equipment for use by the Engineer.
 - 1. One magnetic pull-off type, non-destructive paint film thickness gauge, such as a Mikrotest thickness gauge. Thickness gauge to become Owner's.
 - 2. One set of certified coating thickness calibration standards produced by the U.S. Department of Commerce. Calibration standards to become Owner's.
 - 3. One "wet sponge," low voltage, D.C. type holiday detector, such as the Tinker-Razor Electrical Holiday Detector.
- D. Provide the Engineer with the proper safety equipment for observation and testing of the applied coating.
- E. To facilitate Engineer's inspection of coated surfaces, Contractor to provide scaffolding/rigging and adequate illumination as required to perform the dry film thickness reading and holiday test inspections as required by this specification and the referenced standards. Provide personnel to move the scaffolding, lighting, or rigging at the request of the Engineer.
- F. No equipment is to be placed in service until the protective coating has been tested and approved by the Engineer.

3.08 PROTECTION

- A. Contractor is solely and completely responsible for conditions of the job site including safety of all persons (including employees) and property during performance of the work. This requirement applies continuously and is not limited to normal working hours. Conform with safety provisions of the U.S. Department of Labor, Occupational Safety and Health Act, any equivalent State law, and all other applicable Federal, State, and local laws, ordinances, and codes.
- B. Protect floors and all other areas where work is done, with suitable drop cloths.
- C. Remove, mask, or otherwise protect all hardware, hardware accessories, lighting fixtures, switchplates, machined surfaces, couplings, shafts, bearings, labels, nameplates, etc. and other surfaces not intended to be painted prior to surface preparation and painting. Reinstall the removed items by workmen skilled in the trades involved.

- D. Contractor is cautioned of the potential risk of damage and/or nuisance to the adjoining property and/or structures. Contractor is responsible for providing necessary equipment and/or controls to minimize the carryover of dust, paint, and abrasives. If excessive dust, paint, or abrasives are determined by the Owner, or their representative, to be affecting adjoining property and/or structures, Contractor to utilize shrouds, drop tubes, or other means to confine a minimum of 95 percent of the abrasive, paint, and other material to the associated work area.
- E. Protect working parts of mechanical and electrical equipment from damage. Mask openings in motors to prevent paint and other materials from entering motor.

3.09 SCHEDULES

- A. Attachments to this Section define System Schedule (Table 1) and Coating Schedule (Table 2).

3.10 MEASUREMENT AND PAYMENT

- A. No separate measurement or payment for work performed under this Section. Include cost of same in Contract price bid for work of which this is a component part.

TABLE 1 – SYSTEM SCHEDULE							
Type of Surface	Exposure	Surface Preparation/ Cleaning	Table 2 – Material Reference				Minimum Total Mils Thickness
			Primer	1 st Coat	2 nd Coat	3 rd Coat	
Polished Concrete Block	Exterior & Interior	Manufacturer's Specification	Spray on sealant as recommended by manufacturer of polished face CMU				
Concrete Block Walls	Interior - Painted	Paragraph 3.02 B	—	1	2	2	3.0 (Finish Coat)
Concrete Walls	Interior	Paragraph 3.02 B	—	1	2	2	3.0 (Finish Coat)
Wallboard (Egg Shell)	Interior	Manufacturer's Specification	7	8	10	10	4.0 + texture
Metal Doors & Frames	Exterior & Interior	NACE-#4 1.0 Mils Surface Profile	6	2	—	—	4.0
Structural and Misc. Steel	Interior	NACE-#3 1.0-2.0 Mils Surface Profile	4	5	—	—	5.5
Galvanized Steel	Interior	Solvent Cleaning	3	5	—	—	2.9

TABLE 2 – COATING SCHEDULE

Symbol	Min. Dry MILs Per Coat*	Service	Generic Type	Brand and Manufacturer
1.	NA	Primary Sealer	Acrylic Resin Surfacer	SW PrepRite Interior/Exterior Latex Block Filler (B25W25)
2.	1.5	Finish Coat	Epoxy Semi-Gloss	SW Pro Industrial Pre-Catalyzed Waterbased Epoxy Semi-Gloss (K46)
3.	.4	Galvanized Metal Primer	Single Component Water-Based Wash Primer	SW DTM Wash Primer (B66W1)
4.	3.0	Primer	Acrylic	SW Pro Industrial Pro-Cryl Universal Acrylic Primer (B66-310)
5.	2.5	Steel Interior – Semi-gloss	Acrylic	SW Pro Industrial Multi-surface Acrylic Semi-Gloss (B66-1550)
6.	2.0	Primer	Zinc Rich	SW Zinc Clad XI Water Based Inorganic Zinc Silicate Coating (B69V11/B69D11)
7.	NA	Texture	Acrylic	SW Tuff Surface Premium Texture Finish (A44W00350)
8.	1.2	Primer	Latex	SW ProMar 200 Zero VOC Interior Latex Primer (B28W02600)
10.	1.4	Finish Coat-Eg-Shel	Latex	SW ProMar 200 Zero VOC Eg-Shel Interior Latex (B20W12651)

Notes:

* Or manufacturer's standard, whichever is greater. Do not exceed manufacturer's maximum standard, if applicable.

END OF SECTION

SECTION 09960

HIGH-PERFORMANCE COATINGS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Coatings, including coating systems, surface preparation, application requirements, and quality control requirements.

1.02 REFERENCES

- A. ASTM International (ASTM):
1. D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications.
 2. D2200 – Standard Practice for Use of Pictorial Surface Preparation Standards and Guides for Painting Steel Surfaces.
 3. D3359 - Standard Test Methods for Rating Adhesion by Tape Test.
 4. D3960 - Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings.
 5. D4262 - Standard Test Method for pH of Chemically Cleaned or Etched Concrete Surfaces.
 6. D4263 - Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.
 7. D4285 - Standard Test Method for Indicating Oil or Water in Compressed Air.
 8. D4414 - Standard Practice for Measurement of Wet Film Thickness by Notch Gages.
 9. D4417 - Standard Test Methods for Field Measurement of Surface Profile of Blast-Cleaned Steel.
 10. D4541 - Standard Test Methods for Pull-Off Strength of Coatings Using Portable Adhesion Testers.
 11. D4787 - Standard Practice for Continuity Verification of Liquid or Sheet Linings Applied to Concrete Substrates.
 12. D5162 - Standard Practice for Discontinuity (Holiday) Testing of Nonconductive Protective Coating on Metallic Substrates.
 13. D7234 - Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers.
 14. E337 - Standard Test Method for Measuring Humidity with a Psychrometer (the Measurement of Wet- and Dry-Bulb Temperatures).
 15. F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
 16. F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using In-situ Probes.
- B. International Concrete Repair Institute (ICRI):
1. 310.2 - Guideline for Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair.

- C. NACE International (NACE):
 - 1. SP0178 - Design, Fabrication, and Surface Finish Practices for Tanks and Vessels to Be Lined for Immersion Service.
 - 2. SP0188 - Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates.
- D. National Association of Pipe Fabricators (NAPF):
 - 1. 500-03 - Surface Preparation Standard for Ductile Iron Pipe and Fittings in Exposed Locations Receiving Special External Coatings and/or Special Internal Linings.
- E. NSF International (NSF):
 - 1. 61 - Drinking Water System Components - Health Effects.
- F. Occupational Safety and Health Administration (OSHA).
- G. Society of Protective Coatings (SSPC):
 - 1. Glossary - SSPC Protective Coatings Glossary.
 - 2. Guide 6 - Guide for Containing Surface Preparation Debris Generated during Paint Removal Operations.
 - 3. Guide 15 - Field Methods for Retrieval and Analysis of Soluble Salts on Steel and Other Nonporous Substrates.
 - 4. PA 1 - Shop, Field, and Maintenance Painting of Steel.
 - 5. PA 2 - Procedure for Determining Conformance to Dry Coating Thickness Requirements.
 - 6. PA 9 - Measurement of Dry Coating Thickness Using Ultrasonic Gages.
 - 7. QP 1 - Standard Procedure for Evaluating the Qualifications of Industrial/Marine Painting Contractors.
 - 8. SP 1 - Solvent Cleaning.
 - 9. SP 3 - Power Tool Cleaning.
 - 10. SP 5 - White Metal Blast Cleaning.
 - 11. SP 10 - Near-White Metal Blast Cleaning.
 - 12. SP 11 - Power Tools Cleaning to Bare Metal.
 - 13. SP 13 - Surface Preparation of Concrete.
 - 14. SP 16 - Brush-Off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals.
 - 15. SP COM - Surface Preparation Commentary.
 - 16. SP VIS 1 - Guide and Reference Photographs for Steel Surfaces Prepared by Dry Abrasive Blast Cleaning.
 - 17. SP WJ-1 - Waterjet Cleaning of Metals -- Clean to Bare Substrate.
 - 18. SP WJ-2 - Waterjet Cleaning of Metals -- Very Thorough Cleaning.
 - 19. SP WJ-3 - Waterjet Cleaning of Metals -- Thorough Cleaning.
 - 20. SP WJ-4 - Waterjet Cleaning of Metals -- Light Cleaning.

1.03 DEFINITIONS

- A. Definitions used in this Section are in accordance with definitions referenced in ASTM D16, ASTM D3960, and SSPC Glossary of Definitions.
- B. Specific definitions:
 - 1. Abrasive: Material used for blast cleaning, such as sand, grit, or shot.
 - 2. Abrasive Blast Cleaning: Cleaning/surface preparation by abrasive propelled at high speed.

3. Anchor Pattern: Profile or texture of prepared surface(s).
4. Biogenic Sulfide Corrosion: Corrosion caused by sulfuric acid formed when *Thiobacillus* bacteria metabolizes hydrogen sulfide.
5. Bug Holes: Small cavities resulting when air bubbles are entrapped in the surface of formed concrete during placement and consolidation.
6. System: Protective film with 1 or more coats applied in a predetermined order, including surface preparation and quality control requirements.
7. Coating/Paint/Lining Thickness: Total thickness of primer, intermediate, and/or finish coats after drying or curing.
8. Dew point: Temperature a given air/water vapor mixture starts to condense.
9. Drying Time: Time interval between application and material curing.
10. Dry to Recoat: Time interval between material application and its ability to receive the next coat.
11. Dry to Touch: Time interval between material application and its ability to tolerate a light ouch without coating damage.
12. Exposed Surface: Any indoor or outdoor surface not buried or encased.
13. Feather Edging: Reducing coating thickness at its edge to blend with existing surrounding coating.
14. Feathering: Tapering off a wet edge with a comparatively dry brush.
15. Ferrous: Cast iron, ductile iron, wrought iron, and all steel alloys except stainless steel.
16. Field Coat: Application of a surface coating system at the work site.
17. Finish Coat: Final coat in a paint system, including texture, color, smoothness of surface, and other properties affecting appearance.
18. Hold Point: A defined point, specified in this Section, at which work shall be halted for inspection.
19. Holiday: A discontinuity, skip, void, or pinhole in coating or coating system film that exposes the substrate.
20. Honeycomb: Segregated and porous surface of hardened concrete due to insufficient consolidation.
21. Hydroblast: High or ultra-high pressure water jet surface preparation.
22. Incompatibility: One coating's inability to overlay another coating or surface as evidenced by bleeding, poor bonding, or lifting of old coating; inability of a coating to bond to a substrate.
23. Immersed/Immersion: A service condition in which substrate is submerged, is immediately above liquids, or is subject to frequent wetting, splashing, or washdown.
24. Laitance: A thin, weak, brittle layer of cement and aggregate fines on a concrete surface.
25. Mil: 0.001 inch.
26. Overspray: Dry spray, particularly paint bonded to an unintended surface.
27. Pinhole: A small diameter discontinuity in a coating or coating system film, created by offgassing from a void in a concrete or masonry substrate causing a void between coats or exposing the substrate. Usually caused by coating application while temperature is rising.
28. Pot Life: Time interval after components are mixed and coating can be satisfactorily applied.
29. Prime Coat: First full paint coat applied to a surface when using a multicoat system. Primers adhere to a new substrate, protect the substrate, and promote adhesion of subsequent coats of paint. The prime coat on metal surfaces is the first full coat and does not include solvent wash, grease emulsifiers, or other pretreatment applications.

30. Resurfacer/Resurfacing Material: A layer of cementitious and/or resin-based material used to fill or otherwise restore surface continuity to worn or damaged concrete surfaces.
31. Shelf Life: Maximum storage time a material may be stored without losing its usefulness.
32. Shop Coat: 1 or more coats applied in an off-site shop or plant before shipment to work site where field or finishing coat(s) are applied.
33. Spreading Rate: Area covered by a unit volume of paint at a specific thickness.
34. Stripe Coat: A separate brush coat of paint applied to all weld seams, pits, nuts/bolts/washers, and edges. This coat shall not be applied until previous coats have cured. Once applied, the coat shall be allowed to cure before subsequent coats are applied.
35. Tie Coat: An intermediate coat that bonds different types of paint material, improving succeeding coat adhesion.
36. Thick Film Coating System: A coating system applied with a minimum dry film thickness of 25 mils.
37. Touch-Up Painting: Application of paint on previously painted surfaces to repair marks, scratches, and deteriorated or damaged areas to restore the appearance and performance of the coating.
38. Water Blast: An alternative to air abrasive blast cleaning that can be used with or without abrasive injection. Water cleaning at pressures up to 5,000 pounds per square inch is called low-pressure water cleaning or power washing. High-pressure water cleaning uses water pressures between 5,000 and 10,000 pounds per square inch. Water jetting is water blasting with added abrasive at pressures between 10,000 and 25,000 pounds per square inch. Ultra-high-pressure water jetting is water blasting at pressures above 25,000 pounds per square inch.
39. Weld Splatter: Beads of non-structural weld metal that adhere to the surrounding surface, removed as part of surface preparation.

1.04 ABBREVIATIONS

- A. CSM - Coating System Manufacturer.
- B. CMU - Concrete Masonry Units.
- C. CSA - Coating System Applicator. Specialty subcontractor retained by the Contractor to install the coating systems specified in this Section.
- D. CTR - Coating System Manufacturer's Technical Representative.
- E. DFT - Dry-Film Thickness. Thickness of cured film, usually expressed in mils (0.001 inch).
- F. SSD - Surface Saturated Dry. Refers to concrete surface condition where the surface is saturated (damp) without the presence of standing water.
- G. TPC - Technical Practice Committee.

- H. VOC - Volatile Organic Compound. Portion of the coating that is a compound of carbon, is photochemically reactive, and evaporates during drying or curing; expressed in grams per liter (g/l) or pounds per gallon (lb/gal). VOC is determined by EPA Method 24.
- I. WFT - Wet Film Thickness. Coating thickness as measured immediately after application. Usually expressed in mils (0.001 inch).

1.05 PERFORMANCE REQUIREMENTS

- A. Coating materials shall be formulated for environments encountered in water and wastewater treatment processes.
- B. Coating materials that come in contact with water distributed as potable water shall be certified in accordance with NSF 61.

1.06 SUBMITTALS

- A. As specified in Section 01300 - Submittals, submit the following:
 - 1. Schedule of proposed coating materials.
 - 2. Schedule of surfaces to be coated with each coating material.
 - 3. Dehumidification and heating plan.
 - 4. Product data:
 - a. Physical properties of coatings, including the following:
 - 1) Solids content.
 - 2) Ingredient analysis.
 - 3) VOC content.
 - 4) Temperature resistance.
 - 5) Typical exposures and limitations.
 - 6) Manufacturer's standard color chips.
 - b. Compliance with regulatory requirements:
 - 1) VOC limitations.
 - 2) Lead compounds and polychlorinated biphenyls.
 - 3) Abrasives and abrasive blast cleaning techniques and disposal.
 - 4) Methods for tenting blasting areas and methods to protect existing equipment from dust and debris.
 - 5) NSF certification of coatings for potable water supply systems.
 - c. CSM's current printed recommendations and product data sheets for coating systems, including:
 - 1) Surface preparation recommendations.
 - 2) Primer type.
 - 3) Maximum dry and wet-mil thickness per coat and number of coats.
 - a) Coating Coverage Worksheets.
 - 4) Minimum and maximum curing time between coats, including atmospheric conditions for each.
 - 5) Curing time before submergence in liquid.
 - 6) Thinner to be used for each coating.
 - 7) Ventilation requirements.
 - 8) Minimum and maximum atmospheric conditions during which the paint shall be applied.
 - 9) Allowable application methods.
 - 10) Maximum allowable substrate moisture content.

- 11) Maximum shelf life.
 - 12) Requirements for transportation and storage.
 - 13) Mixing instructions.
 - 14) Shelf life.
 - 15) Material Pot life.
 - 16) Precautions for applications free of defects.
 - 17) Method of application.
 - 18) Drying time of each coat, including prime coat.
 - 19) Compatible prime coats.
 - 20) Limits of ambient conditions during and after application.
 - 21) Required protection from sun, wind, and other conditions.
 - 22) Touch-up requirements and limitations.
 - 23) Minimum adhesion of each system submitted in accordance with ASTM D4541 and ASTM D7234.
- d. Samples: Include 8-inch square drawdowns or brushouts of topcoat finish when requested. Identify each sample as to finish, formula, color name and number, sheen name, and gloss units.
 - e. Affidavits signed by an officer of the CSM's corporation attesting to full compliance of each coating system component with current federal, state, and local air pollution control regulations and requirements.
 - f. List of cleaning and thinner solutions allowed by the CSMs.
 - g. Storage requirements, including temperature, humidity, and ventilation for Coating System Materials as recommended by the CSMs.
 - h. Thick film coating systems (greater than 25 mils):
 - 1) CSM's detailed written instructions for coating system treatment and graphic details for coating system terminations in coated structures, including pipe penetrations, metal embedments, gate frames, and other terminations encountered.
 - 2) Include detail treatment for coating system at concrete joints.
 - 3) Manufacturer's Representative's (CTR) Field Reports.
5. Quality assurance submittals:
- a. Quality assurance plan.
 - b. Qualifications of CSA, including:
 - 1) List of Similar Projects.
 - a) Name and address of project.
 - b) Year of installation.
 - c) Year placed in operation.
 - d) Point of contact: Name and phone number.
 - 2) Provide a minimum of 5 project references, each including contact name, address, and telephone number where similar coating work has been performed by their company in the past 5 years.
 - c. CSA Reports:
 - 1) Written daily quality control inspection reports.
 - d. CTR Reports:
 - 1) Reports on visits to project site to view and approve surface preparation of structures to be coated.
 - 2) Reports on visits to project site to observe and approve coating application procedures.
 - 3) Reports on visits to coating plants to observe and approve surface preparation and coating application on shop-coated items.

1.07 QUALITY ASSURANCE

- A. CSA qualifications:
 - 1. Minimum of 5 years of experience applying specified type or types of coatings under conditions similar to those of the Work:
 - a. Provide qualifications of applicator and references listing 5 similar projects completed in the past 5 years.
 - 2. SSPC QP 1 certified.
 - 3. Manufacturer-approved applicator when manufacturer has approved applicator program or when required in these specifications.

- B. CTR qualifications:
 - 1. Certification, one of the following:
 - a. NACE Level 2 or 3 Certified Coating Inspector.
 - b. SSPC Level 3 Protective Coatings Inspector.
 - 2. Minimum of 5 years of experience evaluating application of manufacturer's coatings under conditions similar to those of the Work:
 - a. Provide CTR qualifications and references listing 5 similar projects completed in the past 5 years.

- C. Regulatory requirements: Comply with governing agencies' regulations by using coatings conforming to their VOC limits.
 - 1. Lead-based coatings are not permitted.
 - 2. Do not use coal-tar epoxy in contact with drinking water or exposed to ultraviolet radiation.

- D. Certification:
 - 1. Certify that applicable pigments resist deterioration when exposed to hydrogen sulfide and other sewage gases.
 - 2. Product data shall designate coating as being suitable for wastewater service.

- E. Pre-installation conference: Conduct as specified in City of Austin Section 01200 - Project Meetings.
 - 1. Coordinate Hold Point schedule

- F. Field samples:
 - 1. Prepare and coat a minimum 100-square-foot area of each system between corners or limits such as control or construction joints.
 - 2. Approved field sample may be part of the Work.

- G. Obtain approval before coating other surfaces. Use products by same manufacturer for prime coats, intermediate coats, and finish coats on same surface, unless specified otherwise.

- H. CSM services:
 - 1. CSA shall arrange for CTR to attend pre-installation conferences.
 - 2. Visit the project site periodically to consult on and inspect specified surface preparation and application Hold Points.
 - 3. Visit coating plants to observe and approve surface preparation procedures and coating application of items to be shop primed and coated.
 - 4. CTR shall provide written inspection reports.

- I. Quality control requirements:
1. Contractor shall be responsible for the workmanship and quality of the coating system installation.
 - a. Inspections by Owner, Engineer, CSA, or CTR will not relieve or limit Contractor's responsibilities.
 2. Conform to this specification's requirements and the standards referenced in this Section. Changes in the coating system application requirements will be allowed only with the Engineer's written acceptance.
 3. Specially trained crews with experience applying the specified coating system coating are required for:
 - a. Coating application using plural component spray equipment or other specialty equipment.
 - b. Coating with specialty linings for severe service conditions, including floor coatings, and with linings for corrosive headspaces or secondary containment areas.
 4. CTR shall specially train personnel for coating systems as specified in Appendix B Coating Detail Sheets.
 - a. CSM shall approve personnel in writing applying the coating system.
 5. Do not use contaminated, outdated, diluted materials, and/or materials from previously opened containers.
 6. Identify inspection access points used by Owners or Engineers.
 7. Provide ventilation, ingress, egress, or other means as necessary for Owner's or Engineer's personnel to safely access the work areas.
 8. Conduct and continually inspect work so the coating system is installed as specified. The CSM shall provide written directions to correct coating work not conforming to the specifications or is otherwise unacceptable.
 9. Provide written daily reports summarizing test data, work progress, surfaces covered, ambient conditions, quality control inspection test findings, and other information pertinent to the coating system application.
 - a. Determine relative humidity in accordance with ASTM E337. Confirm other conditions, such as proper protective measures for surfaces not to be coated and safety requirements for personnel.
 - 1) Measure daily at shift's beginning and end and at intervals not to exceed 4 hours during the shift.
 - 2) Determine the acceptability of weather and/or environmental conditions within the structure in accordance with the CSM's requirements.
 - b. Monitoring surface preparation: Spot check cleanliness, surface profile, and surface pH testing at least 3 times daily. Check each surface at least once. In accordance with:
 - 1) ASTM D4262.
 - 2) ASTM D4263.
 - 3) ASTM D4417.
 - 4) ICRI 310.2 requirements.
 - 5) SSPC Surface Preparation Standards.
 - c. Confirm that compressed air used for surface preparation or blow-down cleaning is free of oil and moisture.
 - d. Monitor surface preparation daily at shift's beginning and end and at intervals not to exceed 4 hours during the shift.
 - e. Do not apply coatings when environmental conditions are outside of the CSM's published limits.

- f. Monitoring coatings application: Continuously inspect, measure, and record the wet film thickness and general film quality (visual inspection) for runs, sags, pinholes, holidays, etc. during coating.
 - 1) Perform WFT measurements in accordance with ASTM D4414.
- g. Post cure evaluation: Measure and inspect the overall dry film thickness on all surfaces. Conduct a DFT survey and perform adhesion testing, holiday detection, or cure testing as required in this Section and/or the CSM's written instructions. Perform all applicable tests in accordance with ASTM D4541, ASTM D4787, ASTM D5162, ASTM D7234, SSPC-PA 1, SSPC-PA 2, SSPC-PA 9, and other pertinent standards and recommended practices.

J. Inspection at Hold Points:

- 1. Conduct inspections at Hold Points during the coating system application and record the results.
- 2. Coordinate Hold Points with the Engineer so the Engineer can observe Contractor's inspections on a scheduled basis.
- 3. Provide the Engineer a minimum of 24 hours of notice before conducting Hold Point Inspections.
- 4. Hold Points shall be as follows:
 - a. Conditions before surface preparation: Before starting surface preparation, observe, record, and confirm that oil, grease, and/or soluble salts are gone from the surface.
 - b. Post surface preparation: After completing surface preparation, measure and inspect for cleanliness and proper surface profile as specified in this Section and in the CSM's written instructions.
 - c. Coatings application: At the beginning of any coating system application, measure, record, and confirm acceptability of surface and ambient air temperature and humidity. Inspect applicator's equipment for serviceability and suitability for coatings application.
 - d. Post application inspection: Identify defects in application work on all surfaces, including pinholes, holidays, excessive runs or sags, inadequate or excessive film thickness, and other problems.
 - e. Follow-up corrective actions and final inspection: Measure and re-inspect corrective coating work performed to repair defects at prior Hold Points, and repeat until the surface condition is acceptable. Conduct final visual inspection with follow-up tests, such as holiday detection, adhesion tests, and DFT surveys.
 - f. Coatings application: At the beginning of coating system application, measure, record, and confirm acceptability of surface and ambient air temperature and humidity. Inspect applicator's equipment for serviceability and suitability for coatings application.
 - 1) Observe conditions during the Pre-application Meeting.

1.08 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products as specified in Section 01600 - Product Requirements.
- B. Immediately remove unspecified and unapproved coatings from Project site.

- C. Deliver new labeled, unopened containers:
 - 1. Do not deliver materials after manufacturer's expiration date or over 12 months from manufacturing date, whichever is more stringent. Store materials in well-ventilated enclosed structures and protect from weather and excessive heat or cold in accordance with the CSM's recommendations.
 - a. Store flammable materials in accordance with federal, state, and local requirements.
 - b. Store rags and cleanup materials appropriately to prevent fire and spontaneous combustion.
 - 2. Store and dispose of hazardous waste in accordance with federal, state, and local requirements. This requirement specifically applies to waste solvents and coatings.
 - 3. Container labels shall show the following:
 - a. Brand name or product title.
 - b. CSM's batch number.
 - c. CSM's manufacture date.
 - d. CSM's name.
 - e. Generic material type.
 - f. Application and mixing instructions.
 - g. Hazardous material identification label.
 - h. Shelf life expiration date.
 - i. Color.
 - j. Mixing and reducing instructions.
 - 4. Clearly mark containers to indicate safety hazards associated with the use of or exposure to materials.

1.09 PROJECT CONDITIONS

- A. Apply coatings to dry surfaces.
 - 1. Surface moisture: Comply with manufacturer's requirements or as specified in this Section.
 - a. Plaster and gypsum wallboard: 12 percent.
 - b. Masonry and concrete block: 12 percent.
 - c. Concrete floors: Moisture vapor transmission rate of no more than 3.0 pounds per 1,000 square feet per 24 hours in accordance with ASTM F1869 or relative humidity no greater than 80 percent if tested in accordance with ASTM F2170 unless the CSM's recommendations are more restrictive.
 - d. Concrete structures: Negative results from Plastic Sheet Test in accordance with ASTM D4263, and maximum of 80 percent relative humidity in accordance with ASTM F2170.
- B. Do not apply coatings when the following conditions exist. If such conditions exist, provide containment, covers, environmental controls, and other necessary measures.
 - 1. During rainy, misty, or damp weather, or to surfaces with frost or condensation.
 - 2. When the surface temperature is below 10 degrees Fahrenheit above the dew point.
 - 3. When ambient or surface temperature:
 - a. Is less than 55 degrees Fahrenheit unless manufacturer allows a lower temperature.

- b. Is less than 65 degrees Fahrenheit for clear finishes, unless manufacturer allows a lower temperature.
 - c. Exceeds 90 degrees Fahrenheit, unless manufacturer allows a higher temperature.
 - d. Exceeds manufacturer's recommendation.
 - 4. When relative humidity is higher than 85 percent.
 - 5. Under dusty or adverse environmental conditions.
 - 6. When light on surfaces measures less than 15 foot-candles.
 - 7. When wind speed exceeds 15 miles per hour.
- C. Apply coating only under evaporation conditions rather than condensation.
 - 1. Use dehumidification equipment, fans, and/or heaters inside enclosed areas to maintain required atmospheric and surface temperature requirements for proper coating application and cure.
 - 2. Measure and record relative humidity and air and surface temperatures at the start and end of each shift to confirm proper humidity and temperature levels inside the work area.
 - a. Submit test results.
- D. Continuously ventilate, dehumidify, and heat enclosed spaces with high humidity during surface preparation, coating application, and curing.
 - 1. Maintain minimum air temperature of 55 degrees Fahrenheit and 10 degrees Fahrenheit above the dew point.
 - 2. Maintain dew point of at least 10 degrees Fahrenheit less than the temperature of the coldest part of the structure where work is performed.
 - 3. Reduce dew point temperature in conditioned space by at least 10 degrees Fahrenheit within 20 minutes.
 - 4. Seal work areas and maintain positive pressure per dehumidification equipment supplier's recommendations.
 - 5. Maintain these conditions before, during, and after application to ensure proper adhesion and cure of coatings for no less than:
 - a. Entire curing period.
 - b. 8 hours after coating.
- E. Systems:
 - 1. Temporary electrical power:
 - a. Arrange with local utility to provide adequate temporary electrical service.
 - b. Provide and maintain adequate jobsite power distribution facilities conforming to applicable Laws and Regulations.
 - c. Provide, maintain, and pay for electric power for performance of the Work, except for power required for the final 30-day operational test.
 - 2. Temporary electrical lighting:
 - a. In work areas, provide temporary lighting sufficient to maintain lighting levels during working hours not less than lighting levels required by OSHA and state agency which administers OSHA regulations where Project is located.
 - b. When available, permanent lighting facilities may be used in lieu of temporary facilities:
 - 1) Prior to final completion of the Work, replace bulbs, lamps, or tubes used by Contractor for lighting.

3. Internal combustion engine generators may be used.
 - a. Obtain required permits and provide air pollution and noise control devices on equipment as required by permitting agencies require.
 - b. Comply with state, federal, and local fire and explosion protection measures when locating and operating generator.
 - c. Locate engine generator outside hazardous classified areas per NFPA 820.
 - d. Provide daily fuel service for generator for duration of use.
 4. Dehumidification:
 - a. Provide desiccant or refrigeration drying.
 - b. Use only desiccant types with a rotary desiccant wheel capable of continuous operation.
 - c. Liquid, granular, or loose lithium chloride drying systems are not acceptable.
 5. Heating:
 - a. Use electric, indirect combustion, or steam coil.
 - b. Direct-fired combustion heaters are not acceptable heat sources during abrasive blasting, coating application, or coating cure.
 6. Filters:
 - a. Use a filtration system for dust removal designed to not interfere with dehumidification equipment's ability to control dew point and relative humidity inside the reservoir.
 - b. Do not allow air from the working area or dust filtration equipment to recirculate through their dehumidifier during coating application or when solvent vapors are present.
 7. Design and submittals:
 - a. Prepare and submit dehumidification and heating plan, including all equipment and operating procedures.
 - b. Suppliers of services and equipment shall have at least 3 years of experience in similar applications.
- F. Provide containment and ventilation system components in accordance with SSPC-Guide 6, Level 3 and as required for hazardous materials.

1.10 MAINTENANCE

- A. Provide table of products applied organized by surface type. List coating manufacturer, color, color formulation, distributor name, telephone number, and address.

1.11 CTR RESPONSIBILITIES

- A. General:
 1. Attend pre-installation conference.
 2. Perform onsite application training.
 3. Periodically inspect coating system application.
- B. Coating system installation training:
 1. Provide a minimum of 8 hours of classroom and off-site training for application personnel and supervisory personnel in one of the following ways:
 - a. Train a minimum of 2 supervisory personnel and 2 application personnel.

- b. Submit a letter from the CSM stating that CSM approves the supervisory and application personnel, listed by name and responsibility, and no additional training is required.
 2. CTR can train up to 14 application personnel and 3 supervisory personnel at a time.
 3. Minimum training requirements:
 - a. Explain in detail the mixing, application, curing, and termination requirements.
 - b. Provide hands-on demonstration of coating system mixing.
 - c. Explain in detail the ambient condition requirements for temperature and humidity.
 - d. Explain in detail the surface preparation requirements.
 - e. Explain in detail the re-coat times, cure times, and related ambient condition requirements.
 - f. Write a letter stating that training was satisfactorily completed by the personnel, listed by name and responsibility.
 4. Provide special training as specified in the Coating Detail Sheets.
- C. Coating system inspection:
 1. CTR inspection is in addition to the CSA's inspection as specified in this Section.
 2. Be on-site to oversee:
 - a. Coating application at least once a week.
 - b. End of surface preparation.
 - c. During coating application.
 - d. Post-cure inspection.
 3. Routinely inspect and verify in writing that application personnel have successfully performed surface preparation, filler/surfacer application, coating system application, and Quality Control Inspection in accordance with this Section and to warrantable quality.
 4. Perform the following activities to confirm conformance with the specifications:
 - a. Inspect ambient conditions during coating system installation at Hold Points for conformance with the specified requirements.
 - b. Inspect each coated surface type and coating system applied to verify the following:
 - 1) Cleanliness.
 - 2) Surface pH for concrete substrates.
 - 3) Confirm surface preparation of substrates where coating system will terminate or will be applied for conformance to the specified application criteria.
 - c. Verify surface profile of substrates by completing the following:
 - 1) Inspect preparation and application of coating detail treatment at terminations, transitions, metal embedments in concrete, and joints and cracks in substrates.
 - 2) Inspect application of filler/surfacer materials for concrete and masonry substrates.
 - 3) Verify proper mixing of coating materials.
 - 4) Inspect application of primers and finish coats, including wet and dry film thickness.
 - 5) Inspect coating systems for proper cure times and conditions.
 - d. Review adhesion testing of cured coating systems.
 - e. Review coating system continuity testing.

- f. Inspect and record representative-localized repairs.
- g. Conduct final review of completed coating system installation.
- h. Prepare and submit site visit reports after each site visit to document that the coating work is in accordance with the CSM's Recommendations.

PART 2 PRODUCTS

2.01 MATERIALS

- A. General:
 - 1. Product requirements as specified in Section 01600 - Product Requirements.

2.02 COATING SYSTEMS IDENTIFICATION

- A. Naming Conventions: Coating Systems Identifications contain the elements defined in Table 1.

Table 1 Coating System Identification Elements						
First Element	-	Second Element	-	Third Element	-	Fourth Element (optional)
3 or 4 alpha characters		1-3 alpha characters		1 number		3 or 4 alpha characters
Coating Type		Substrate		System Number		Additional Substrate or Special Condition
Example: EPX	-	C	-	6	-	BSC

- 1) First element identifies the coating type using the following abbreviations:
 - a) ACR: acrylic.
 - b) CTE: coal tar epoxy.
 - c) ELA: elastomeric acrylic.
 - d) EPU: epoxy-polyurethane.
 - e) EPX: epoxy.
 - f) POL: polyurethane.
 - g) SIL: silicone.
 - h) SILX: siloxane or silane.
 - i) VE: vinyl ester.
- 2) Second element identifies the substrate using the following abbreviations:
 - a) C: concrete or masonry.
 - b) F: concrete flooring.
 - c) FRP: fiber-reinforced plastic.
 - d) GM: galvanized metal.
 - e) M: metal.
 - f) PVC: polyvinyl chloride, chlorinated polyvinyl chloride.
- 3) Third element identifies the sequential system number.
 - a) For example, EPX-C-2 is the second standard epoxy coating system for concrete substrates.

- 4) Fourth element is optional and identifies the additional substrate or special condition with the following abbreviations:
 - a) PWS: Potable water service applications (NSF-61 approved).
 - b) BSC: Biogenic sulfide corrosion-resistant applications in wastewater.
 - c) BG: Below grade or buried.
 - d) OZ: Organic zinc primer, epoxy polyurethane system.
 - e) SC: Secondary containment.

2.03 PRODUCTS FOR COATING SYSTEMS

- A. Products: As specified in Appendix B Coating Detail Sheets.
- B. Cleaning solvents:
 1. Requirements for solvent wash, solvent wipe, or cleaner used, including, but not limited to, those used for surface preparation in accordance with SSPC-SP 1:
 - a. Emulsifying type.
 - b. Containing no phosphates.
 - c. Biodegradable.
 - d. Does not damage zinc.
 - e. Compatible with the specified primer.
 - f. Complying with applicable air-quality control board requirements.
 2. Use clean white cloths and clean fluids in solvent cleaning.

PART 3 EXECUTION

3.01 GENERAL PROTECTION REQUIREMENTS

- A. Protect adjacent coated surfaces from coatings and damage associated with coating work. Repair damage resulting from inadequate or unsuitable protection.
- B. Use drop cloths and other coverings to protect adjacent surfaces not to be coated against spatter and droppings.
- C. Mask off surfaces of items not to be coated or remove items from area.
- D. Furnish and deploy sufficient drop cloths, shields, and protective equipment to prevent spray or droppings from fouling surfaces not being coated and, in particular, surfaces within storage and preparation areas.
- E. Place coating waste, cloths, and material that may pose a fire hazard in closed metal containers and remove daily from site.
- F. Remove electrical plates, surface hardware, fittings, and fasteners before coating application. Carefully store, clean, and replace items after completing coating in each area. Do not use solvent or degreasers to clean hardware that may remove permanent lacquer finishes.
- G. Erect and maintain protective enclosures in accordance with SSPC- Guide 6.

- H. Protect the following surfaces from abrasive blasting by masking or by other means:
 - 1. Threaded portions of valve and gate stems, grease fittings, and identification plates.
 - 2. Machined surfaces for sliding contact.
 - 3. Surfaces to be assembled against gaskets.
 - 4. Surfaces of shafting where sprockets will be fit.
 - 5. Surfaces of shafting where bearings will be fit.
 - 6. Machined bronze surfaces, including slide gates.
 - 7. Cadmium-plated items, except cadmium-plated, zinc-plated, or sherardized fasteners used to assemble equipment requiring abrasive blasting.
 - 8. Galvanized items, unless scheduled to be coated.
- I. Protect installed equipment, mechanical drives, and adjacent coated equipment from abrasive blasting to prevent damage caused by spent abrasive blast media, dust, or dirt entering such equipment.
- J. Schedule cleaning and coating to keep dust and spray from the cleaning process from falling on wet, newly coated surfaces.
 - 1. Whenever possible, coordinate with other trades and complete surface preparation and coating work before installing hardware, hardware accessories, nameplates, data tags, electrical fixtures, and similar uncoated items that will be in contact with coated surfaces. Mask machined surfaces, sprinkler heads, and other small items that will not be coated.
 - 2. After completing coating, reinstall removed items.
 - 3. Disconnect and move equipment adjacent to walls to clean and coat equipment and walls. Replace and reconnect equipment after coating.

3.02 GENERAL SURFACE PREPARATION REQUIREMENTS

- A. Prepare surfaces in accordance with CSM's instructions unless more stringent requirements are specified in this Section.
- B. Coating detail sheets in Appendix B include additional surface preparation requirements.
- C. Follow more stringent requirement if information conflicts.
- D. Where required by the Owner's representative, a NACE International certified coatings inspector, provided by the Owner, will inspect and approve surfaces to be coated before applying a coating.
 - 1. CSA shall coordinate coating inspections.
 - a. Identify coating inspection Hold Points during the pre-installation conference.
 - b. Provide at least 2 days' notice before inspection.
 - 2. Contractor shall correct surface defects identified by the inspector at no additional cost to Owner.

3.03 MECHANICAL AND ELECTRICAL EQUIPMENT PREPARATION

- A. Identify equipment, ducting, piping, and wires and cables as specified in Section 15075 - Equipment Identification, Section 15076 - Pipe Identification, and Section 16205 - Wire and Cable Tagging.

- B. Remove grilles, covers, and access panels for mechanical and electrical system and coat separately.
- C. Prepare and finish coat equipment primed by the manufacturer using specified intermediate and top coats, as applicable, and color selected by the Owner.
- D. Prepare, prime, and coat both insulated and bare pipes, conduits, boxes, insulated and bare ducts, hangers, brackets, collars, and supports, except where items are covered with material not requiring coating, or with a prefinished coating.
- E. Replace identification markings on mechanical or electrical equipment when coated over or spattered.
- F. Prepare and coat interior surfaces of air ducts and convector and baseboard heating cabinets visible through grilles and louvers with 1 coat of flat black paint to limit of sight line.
- G. Prepare and coat dampers exposed immediately behind louvers, grilles, and convector and baseboard heating cabinets to match face panels.
- H. Prepare and coat exposed conduit and appurtenances occurring in finished areas with color and texture to match adjacent surfaces.
- I. Prepare and coat sides' front, back, and edges of plywood backboards for electrical equipment before installing backboards and mounting equipment on them.
- J. Color code equipment, piping, conduit, and exposed ductwork and apply color banding and identification, such as flow arrows, naming, and numbering, in accordance with the Contract Documents.

3.04 CLEANING OF NEW AND PREVIOUSLY COATED OR NEW SURFACES

- A. Utilize cleaning agent to remove soluble salts, such as chlorides, from concrete and metal surfaces:
 - 1. Cleaning agent: Biodegradable non-flammable and containing no VOC.
 - 2. Manufacturers: The following or equal:
 - a. CHLOR*RID International, Inc.
 - 1) Complete soluble salt removal with steam or warm water cleaning.
 - 3. Clean surfaces with decontamination agent in conjunction with abrasive blast cleaning, steam cleaning, high-pressure washing, or hand washing, as approved by the CTR and the Engineer.
 - 4. Test cleaned surfaces to ensure removal of soluble salts. Carry out additional cleaning as needed.
 - 5. Complete final surface preparation before applying new coating system in strict accordance with CSM's printed instructions.

3.05 BLAST CLEANING

- A. Surface preparation requirements:
 - 1. Do not reuse spent blast abrasive.
 - 2. Ensure that filter compressed air used for blast cleaning is free of condensed water and oil. Clean moisture traps at least once every 4 hours or more frequently, as required, to prevent moisture from entering the abrasive blasting

- equipment air supply. Check blast air for moisture and oil after each cleaning in accordance with ASTM D4285.
3. Install oil separators just downstream of compressor discharge valves and at the discharge point of blast pot discharges. Check separators on the same frequency as the moisture traps.
 4. Keep regulators, gauges, filters, and separators on compressor air lines to blasting nozzles operational at all times.
 5. Install an air dryer or desiccant filter drying unit to dry the compressed air before blast pot connections. Use and maintain the dryer throughout surface preparation work.
 6. Use a venturi-type, or other high velocity-type, abrasive blast nozzles supplied with at least 100 pounds per square inch gauge air pressure at the nozzle and enough volume to obtain appropriate blast cleaning production rates and surface cleanliness.
 7. Provide airborne particulate evacuation and filtering that meets OSHA safety standards. Maintain optimal visibility both to clean and provide the specified surface profile and to allow inspection of the substrate during surface preparation work.
 8. If prepared and cleaned metallic substrates become contaminated between final surface preparation work and coating system application, or if the prepared substrate darkens or changes color, re-clean by water blasting, or abrasive blast cleaning as appropriate until the specified degree of cleanliness is restored.
- B. Water jetting or water blasting:
1. Use water jetting or water blasting for recoating or relining where an adequate surface profile exists.
 2. Perform water jetting or water blasting in accordance with SP 13 and SSPC-WJ-1, WJ-2, WJ-3, WJ-4.

3.06 PREPARATION REQUIREMENTS FOR CONCRETE SURFACES

- A. Cure for at least 28 days before coating.
- B. Remove degraded concrete using abrasive blast cleaning or high or ultrahigh pressure water jetting, chipping, or other abrading tools until achieving a sound, clean substrate. Remove all bruised or cracked concrete.
- C. Prepare substrate cracks and areas requiring resurfacing; perform detail treatment, including, but not limited to, terminating edges per the CSM's recommendations and as indicated on the Drawings.
1. Prepare concrete surfaces in accordance with SSPC-SP 13.
- D. Prepare concrete surfaces in accordance with SSPC-SP 13.
1. Inspect concrete surfaces to select appropriate surface preparation method to provide a suitable substrate for the specified coating system.
 2. Use blast cleaning or other means to expose the complete perimeter of air voids or bug holes. Do not leave shelled over, hidden air voids beneath the exposed concrete surface.
 3. Repair concrete defects and physical damage.

4. Clean concrete surfaces of dust, mortar, formwork, fins, loose concrete particles, form release materials, oil, and grease.
 5. Fill voids to provide surface as specified in Item No. 411S – Surface Finishes for Concrete.
- E. Provide clean substrate visually free of calcium sulfate, loose, coarse, or fine aggregate, laitance, loose hydrated cement paste, and otherwise harmful substances.
1. Confirm concrete surface minimum pH of 9.0 with surface pH testing.
 2. If after surface preparation the surface pH remains below 9.0, perform additional water blasting, cleaning, or abrasive blast cleaning until additional pH testing indicates an acceptable pH level.
- F. Prepare concrete surface for coating in accordance with SSPC-SP 13.
1. Provide ICRI 310.2 minimum No. 3 concrete surface profile (CSP) or as specified on Coating Detail Sheets.
 2. Evaluate profile of the prepared concrete using ICRI 310.2 surface profile replicas.
- G. Blast clean cementitious repair mortars or grouts to the same profile and degree of cleanliness requirements required for concrete substrates.
- H. Blast clean polymer-based surfacers or waterborne modified cementitious surfaces only if they have exceeded the CSM's recommended recoat time.
- I. Vacuum all concrete surfaces before coating application, leaving a dust free, sound concrete substrate.
1. Thoroughly clean concrete surfaces to be coated to remove loose dirt and spent abrasive.
 2. Remove debris produced by blast cleaning from the structures to be coated, and legally dispose of it off-site.
- J. Test moisture content of concrete to be coated:
1. Conduct ASTM D4263 plastic sheet test at least once for every 500 square feet of surface area to be coated.
 - a. Any moisture on plastic sheet after test period constitutes a non-acceptable test, and the concrete must be dried further.
 2. Conduct ASTM F1869 test at least once for every 1,000 square feet of concrete floor surface area to be coated.
 3. Conduct ASTM F2170 one relative humidity moisture test at least once for each 500 square feet of non-floor concrete surface area where the opposite side is exposed to soil or water.
 - a. Waterproof surfaces exposed to soil or water where specified in Section 07110 - Dampproofing.
 4. Comply with specified minimum moisture content and CSM's written recommendations for moisture vapor transmission rates or relative humidity values.
- K. Masonry surfaces:
1. Cure for at least 28 days before coating.
 2. Prepare masonry surfaces to remove chalk, laitance, loose dirt, dried mortar splatter, dust, peeling, or loose existing coatings, or otherwise deleterious substances to leave a clean, sound substrate.

3. Wash and scrub masonry surfaces with clear water. Do not use muriatic acid.
4. Seal or fill masonry surfaces with a sealer or block filler compatible with the specified primer after cleaning.
5. Confirm that masonry surfaces are dry before coating application.
 - a. If using pressure washing or low-pressure water blast cleaning for preparation, allow the masonry to dry for at least 5 days under dry weather conditions or until the minimum ambient temperature is 70 degrees Fahrenheit before coating.

3.07 GENERAL PREPARATION REQUIREMENTS FOR METALLIC SURFACES

- A. Remove rust, scale, and welding slag and spatter.
 1. Remove and grind smooth all excessive weld material and weld spatter on metal surfaces before blast cleaning in accordance with NACE SP0178, Appendix C, Level C.
 2. Grind sharp edges on metal substrate to approximately 1/16-inch radius before abrasive blast cleaning.
- B. Prepare metallic surfaces in accordance with applicable portions of surface preparation specifications of the SSPC specified for each coating system.
 1. Remove grease and oil in accordance with SSPC-SP 1.
 2. Use solvent as recommended by the CSM.
 3. Measure profile depth of the surface to be coated in accordance with Method C of ASTM D4417. Contractor shall select blast particle size and gradation to produce the specified surface profile.
 4. Constantly monitor and maintain ambient environmental conditions to ensure cleanliness and that no "rust back" occurs before coating material application.
- C. Prepare metallic surfaces by blast cleaning in accordance with SSPC-VIS 1 (ASTM D2200). Prepare abrasive blast representative areas for the Owner's representative to inspect on the first day of cleaning.
- D. Unless otherwise specified, the requirements for blast cleaning steel, ductile iron, and stainless steel substrates are as follows:
 1. Ferrous metal surfaces not to be submerged: Abrasive blast in accordance with SSPC-SP 10 unless blasting may damage adjacent surfaces, is prohibited, or is specified otherwise. Where abrasive blasting is not possible, clean surfaces to bare metal with power tools in accordance with SSPC-SP 11.
 2. Ferrous metal surfaces to be submerged: Abrasive blast in accordance with SSPC-SP 5, unless specified otherwise, to clean and provide roughened surface profile with a depth between 2 and 4 mils.
 3. Remove traces of grit, dust, dirt, rust scale, friable material, loose corrosion products, or embedded abrasive from substrate before coating application.
 4. When abrasive blasted surfaces rust or discolor before coating, abrasive blast clean surfaces again.
- E. Field preparation of shop-primed surfaces:
 1. Smooth welds and prominences with power tools before applying field-applied coatings.
 2. Clean and dry shop-primed ferrous metal surfaces and fabricated assemblies before applying field coats.

3. Prepare shop epoxy primed surfaces with light abrasive blasting or abrading and then vacuum before applying finish coats.
 - a. Follow CSM instructions for surface preparation when the primer recoat limit has been exceeded.
 4. Non-immersion service: Clean in accordance with SSPC-SP 2 (Hand Tool Cleaning) or SSPC-SP 3 (Power Tool Cleaning) and uniformly roughen.
 5. Immersion, BSC, and SC service: Remove shop primer in accordance with SSPC-SP 5 (Near-White Blast Cleaning).
- F. Damaged shop primer or rust bleeding:
1. Ferrous metals: Clean in accordance with SSPC-SP 1 (Solvent Cleaning) and spot blast in accordance with SSPC-SP 10 (Near-White Metal Blast Cleaning) to achieve a uniform surface profile between 2.0 and 2.5 mils before recoating.
 2. Reject galvanized steel with rust bleeding.
- G. Damaged coating: Repair by abrasive blast cleaning surfaces as specified for the coating system; feather to a smooth transition before touching up.

3.08 PREPARATION REQUIREMENTS BY SURFACE TYPE

- A. Galvanized steel and non-ferrous metal surfaces:
1. Degrease or solvent clean (SSPC-SP 1) to remove oily residue.
 2. Abrasive blast clean in accordance with SSPC-SP 16.
 - a. If abrasive blast cannot be performed, abrade in accordance with SSPC-SP 3 (Power Tool Cleaning).
 3. Apply metal pretreatment within 24 hours before coating galvanized surfaces that cannot be thoroughly abraded, such as bolts, nuts, or preformed channels.
 4. Test surface for contaminants using copper sulfate solution.
- B. Stainless-steel surfaces:
1. Abrasive blast clean in accordance with SSPC-SP 16 to leave a clean, uniform appearance with surface profile between 1.5 and 2.5 mils.
- C. Ductile iron pipe and fittings to be lined or coated: Abrasive blast clean in accordance with NAPF 500-03.
- D. Sherardized, aluminum, copper, and bronze surfaces:
1. Abrasive blast clean in accordance with SSPC-SP 16.
 2. Prepare in accordance with CSM's instructions.
- E. Cadmium-plated, zinc-plated, or sherardized fasteners:
1. Abrasive blast in the same manner as uncoated metal when assembling equipment designated for abrasive blasting.
- F. PVC and FRP surfaces:
1. Lightly sand surfaces to be coated.
 - a. Sand to remove gloss and establish uniform surface profile.
 2. Vacuum to remove loose dust, dirt, and other materials.
 3. Solvent clean with clean white rags and allow solvent to evaporate completely before applying coating materials.

3.09 APPLICATION REQUIREMENTS

- A. Apply coatings in accordance with manufacturer's instructions.
- B. Empty aboveground piping to be coated of contents when applying coatings.
- C. Mechanical equipment shop primed by the manufacturer.
 - 1. Pumps and valves: Shop coat with manufacturer's highest quality coating system meeting the project specifications.
 - a. Contractor shall provide CTR shop coating reports.
 - 2. Non-immersed equipment: Touch up shop primer, and coat in the field with specified coating system after installation.
 - a. If project requires equipment removal and reinstallation, complete touch-up coating after final installation.
 - 3. Immersed equipment not shop coated: Remove shop primer before surface preparation and field apply coating.
- D. Verify surface preparation immediately before applying coating in accordance with SSPC SP COM and the SSPC visual standard for the specified surface preparation method.
- E. Allow surfaces to dry, except where coating manufacturer requires surface wetting before coating.
- F. Wash coat and prime sherardized, aluminum, copper, and bronze surfaces, or prime with manufacturer's recommended special primer.
- G. Do not apply coatings to a surface until it has been prepared as specified.
- H. Use equipment designed to apply materials specified.
 - 1. Use compressors with moisture traps and filters that remove water and oils from the air.
 - a. Perform a paper blotter test at the Engineer's request to verify air is sufficiently free of oil and moisture. Do not allow the amount of oil and moisture to exceed CSM-recommended amount.
 - 2. Equip spray equipment with properly sized mechanical agitators, pressure gauges, pressure regulators, and spray nozzles.
- I. Where 2 or more coats are required, tint prime coat intermediate coats as necessary to distinguish each coating and to help indicate coverage.
 - 1. Do not use color additives with chromium, lead or lead compounds that hydrogen sulfide, other corrosive gases, might destroy or alter. Apply the specified number of coats.
- J. Apply coating by brush, roller, trowel, or spray unless a specific application method is required by coating manufacturer's instructions or these Specifications.
 - 1. Apply primer or first coat by brush to power tool cleaned ferrous surfaces.
 - 2. Brush or spray-apply coats for blast-cleaned ferrous surfaces and subsequent coats for non-blast cleaned ferrous surfaces.
 - 3. After prime coat dries, mark, repair, and retest pinholes and holidays before intermediate or top coats are applied.

- K. Spray application:
 - 1. With a brush, stripe coat edges, welds, corners, nuts, bolts, and difficult-to-reach areas, as necessary, before spray application to ensure specified coating thickness along edges.
 - 2. When using spray application, apply each coat to thickness no greater than recommended in coating manufacturer's instructions.
 - 3. Use airless spray method unless air spray method is required by CSM's instruction or these Specifications.
 - 4. Conduct spray coating under controlled conditions. Protect adjacent construction and property from coating mist, fumes, or overspray.

- L. Lightly sand and thoroughly clean surfaces to receive high-gloss finishes unless CSM instructs otherwise.

- M. Remove all dust on coatings between coats.

- N. Shop and field coats:
 - 1. Prime coat: Shop-apply or field-apply prime coats as specified. Use shop-applied primer compatible with the specified field coating system and apply at the minimum dry film thickness recommended by the finish coat CSM.
 - a. Provide data sheets identifying the shop primer to on-site coating application personnel.
 - b. Perform adhesion tests on the shop primer.
 - c. Remove and recoat damaged, deteriorated, and poorly applied shop coatings.
 - d. If shop primer coat meets this Section's requirements, spot prime exposed metal of shop-primed surfaces before spray applying primer over the entire surface.
 - 2. Field coats: Apply field coats with 1 or more prime coats and finish coats to build up coating to dry film thickness specified for the coating system.
 - a. Do not apply finish coats until other work in the area is complete and previous coats are inspected.
 - 3. Adhesion confirmation: Perform adhesion tests after proper coating cure in accordance with ASTM D3359. Demonstrate that:
 - a. Prime coat adheres to the substrate.
 - b. Coatings adhere to the prime and intermediate coats.
 - 1) Coating 5 mils or more DFT: Achieve adhesion test result of 5A on immersed surfaces and 4A or better on other surfaces.
 - 2) Coating less than 5 mils DFT: Achieve adhesion test results of 5B on immersed surfaces and 4B or better on other surfaces.

- O. Brush, roll, trowel, or spray and back roll coats for concrete and masonry.

- P. Plural component coating application:
 - 1. Premix contents of component drums if required by the CSM each day.
 - 2. Before starting application:
 - a. Verify gauges are working properly.
 - b. Complete ratio checks.
 - c. Sample the mix on plastic sheeting to ensure set time is appropriate and complete.
 - d. Label and retain all spray samples. Submit to Engineer when requested.

Q. Drying and recoating:

1. Provide fans, heating devices, or other means to prevent condensate or dew on substrate surface or between coats and during curing after applying the last coat.
2. Allow each coat to cure or dry thoroughly, in accordance with if required in CSM's printed instructions, before recoating.
3. Use CSM's printed instructions and the requirements specified in this Section to determine minimum required drying time.
 - a. Do not allow excessive drying time or exposure, which may impair bond between coats.
 - b. Recoat all coatings within time limits recommended by CSM.
 - c. If time limits are exceeded, abrasive blast clean and de-gloss clean before applying another coat.
4. If limitations on time between abrasive blasting and coating are not met before attaching components to surfaces that cannot be abrasive blasted, coat components before attachment.
5. Ensure primer and intermediate coats of coating are unscarred and completely integral when applying each succeeding coat.
6. Touch up suction spots between coats and apply additional coats where required to produce finished surface of solid, even color, free of defects.
7. Leave no holidays. Repair all holidays in accordance with the requirements on pertinent Coating Detail Sheets or as recommended by the CSM.
8. Sand and feather in to a smooth transition and recoat scratched, contaminated, or otherwise damaged coating surfaces so repairs are invisible to the naked eye.
9. For submerged service or highly corrosive headspace service, provide a letter to the Engineer stating that the lining system is fully cured and ready to be placed into service.

R. Workmanship:

1. Ensure that coated surfaces are free from runs, drips, ridges, waves, laps, and brush marks. Coats shall be applied to produce a smooth, even film of uniform thickness completely coating corners and crevices.
2. Coat surfaces without drops, overspray, dry spray, excessive runs, ridges, waves, holidays, laps, or brush marks.
3. Remove splatter and droppings after coating work is completed.
4. Evenly apply each coat of material and sharply cut to a line created with masking tape or other suitable materials.
5. Avoid over spraying or spattering paint on surfaces not to be coated. Protect glass, hardware, floors, roofs, vehicles, and other adjacent areas and installations by taping, drop cloths, or other suitable measures.
6. When coating complex steel shapes, stripe coat welds, edges of structural steel shapes, metal cut-outs, pits in steel surfaces, or rough surfaces with the primer before overall coating system application.
 - a. Brush apply stripe coat to ensure proper coverage.
 - b. Do not stripe coat with spray or roller.
7. Ensure that finish coat, including repairs, has a uniform color and gloss.

S. Coating properties, mixing, and thinning:

1. Thin prime coat and apply as recommended by the CSM. Thinned coating must comply with prevailing air pollution control regulations.

2. If maximum recoat time is exceeded, prepare surface with solvent washing, light abrasive blasting, or other procedures per CSM's instructions.
 3. Allow adequate drying time between coats as instructed by the CSM, adjusted as necessary for the site conditions.
 4. Ensure that coatings, when applied, provide a satisfactory film and a smooth even surface. Lightly sand glossy undercoats to provide a surface suitable for proper application and adhesion of subsequent coats. Thoroughly stir and strain coating materials during application and maintain uniform consistency.
 5. Mix coatings with 2 or more components in accordance with CSM's instructions.
 6. Where necessary to suit conditions of the surface, temperature, weather and method of application, thin the coating per CSM's recommendations.
 - a. Ensure that volatile organic content (VOC) of the thinned coating complies with prevailing air pollution control regulations.
 - b. Thin coatings to only what is necessary to obtain proper application characteristics.
 - c. Use a thinner recommended by the CSM.
- T. Film thickness and continuity:
1. Apply coating to the specified thicknesses.
 - a. Apply additional coats when necessary to achieve specified thicknesses, especially at edges and corners.
 2. Verify WFT of the coating system first coat and after applying each subsequent coat.
 3. Do not allow the minimum thickness at any point to deviate more than 25 percent from the required average.
 4. Do not allow the surface area covered per gallon of coating for various types of surfaces to exceed those recommended by the CSM.
 - a. Provide coating coverage worksheets listing the maximum and minimum coverage for each unit volume of coating for concrete surfaces.
 5. Apply additional coats to achieve the specified dry film thickness if brush or roller application methods cannot achieve the specified film thicknesses per coat.
- U. Protecting coated surfaces:
1. Do not handle, work on, or otherwise disturb coated items until the coating is completely dry and hard.
 2. After installation, recoat shop-coated surfaces with specified coating system as necessary to match surrounding surfaces, and to coordinate with the specified color identification requirements.
- V. Special requirements:
1. Before erection, apply all but the final finish coat to interior surfaces of roof plates, roof rafters and supports, pipe hangers, piping in contact with hangers, and contact surfaces inaccessible after assembly. Apply final coat after erection.
 2. Coat structural slip-critical connections and high strength bolts and nuts after erection.
 3. Areas damaged during erection:
 - a. Prepare surface for spot repairs as specified for the coating system.
 - b. Recoat with prime coat before applying subsequent coats.

- c. Touch up surfaces after installation.
- d. Clean and dry surfaces to be coated at time of application.
- 4. Coat underside of equipment bases and supports not galvanized with at least 2 coats of primer specified before setting the equipment in place.
- 5. Coat aluminum in contact with concrete.

3.10 APPLICATION REQUIREMENTS FOR CONCRETE COATING SYSTEMS

- A. Apply filler/surfacer as recommended by CSM to fill bug holes and air voids in concrete or block texture in CMU, leaving a uniformly filled surface that does not produce blowholes or outgassing causing the coating system to pinhole.
 - 1. Allow filler/surfacer to cure sufficiently before applying prime coat as required by the CSM. Use the CSM-recommended drying time between coats.
- B. Apply surfacer or filler and let dry before coating application.
 - 1. Use the drying time between filler/surfacer and coating system specified by the CSM for the site conditions.
 - a. Let concrete substrate dry before applying filler/surfacer or coating system materials.
 - 2. If the maximum recoat time is exceeded, prepare surfaces by solvent washing, light abrasive blasting, and other procedures per CSM's instructions.
 - 3. Apply a complete parge coat of the specified filler/surfacer material over the entire substrate before applying the coating system.
 - a. Scrub filler/surfacer into the substrate to completely fill open air voids and bug holes.
 - b. Completely cover the substrate, unless otherwise specified, above such filled voids by 1/8 inch of thickness.
 - c. Provide relatively flat, uniformly even surface before coating application.
 - 4. Secondary containment: Place surfacer or filler 1/16 inch thick above concrete plane to create a monolithic surface free of pinholes.
 - a. Floor surfaces: Broadcast with aggregate to create a non-slip surface texture.
 - b. Remove excess aggregates and apply base coat to encapsulate embedded non-slip aggregate.
- C. Concrete substrate temperatures:
 - 1. Apply filler/surfacer and the coating system when temperatures are falling, typically late afternoon or evening.
 - a. Do not coat concrete with rising concrete substrate surface temperatures or substrates in direct sunlight, to minimize outgassing from the substrate and formation of pinholes, and/or blistering.
 - 2. Should bubbles, pinholes, or other discontinuities form in the applied coating system material, they shall be repaired.
 - a. Should discontinuities develop in the filler/surfacer material or in the first coat of the coating material, repair them before the next coat.
 - b. When discontinuities occur, open the air void behind or beneath the discontinuities and completely fill with specified coating material. Then, abrade the coated area around the discontinuities repair reapply coating over that area.
- D. Perform application detail work in accordance with these Specifications, the CSM's current written recommendations, and drawings, whichever is stricter.

- E. Concrete coating systems application requirements:
 - 1. Concrete coating minimum dry film thickness excludes parge coat, block filler, and sealer.

3.11 COATING SYSTEM SCHEDULE

- A. Appendix A specifies surfaces to be coated in the field with the coating systems required.

3.12 SURFACES NOT REQUIRING COATING

- A. Stainless steel piping, valves, pipe supports, instrument sunshades.
- B. Sliding surfaces on expansion joints, motor and pump shafts, machined surfaces at bearings and seals, grease fittings, etc.
- C. Galvanized structural steel framing, galvanized roof decking, galvanized pipe supports.
- D. Copper and brass pipe, fittings, valves, etc.
- E. Bronze valves, bearings, bushings, and fasteners.
- F. Corrosion resistant special alloys: Inconel, Alloy 20, Hastelloy, etc.
- G. Exterior Concrete.
- H. Plastic surfaces except coat PVC, CPVC, and other plastic piping system exposed to sunlight.
- I. Buried Piping that is encased in concrete or cement mortar.

3.13 QUALITY CONTROL

- A. Owner-provided inspection or inspection by others does not limit the Contractor's or CSA's responsibilities for quality workmanship or quality control as specified or as required by the CSM's instructions. Owner inspection is in addition to any inspection required of the Contractor.
- B. Owner may perform, or contract with an inspection agency to perform, quality control inspection and testing of the coating work covered by this Section. These inspections may include the following:
 - 1. Inspect materials upon receipt to ensure that the CSM supplied them.
 - 2. Verify that specified storage conditions for the coating system materials, solvents, and abrasives are provided.
 - 3. Inspect and record findings for substrate cleanliness.
 - 4. Inspect and record pH of concrete and metal substrates.
 - 5. Inspect and record substrate profile (anchor pattern).
 - 6. Measure and record ambient air and substrate temperature.
 - 7. Measure and record relative humidity.
 - 8. Check for substrate moisture in concrete.
 - 9. Verify that mixing of coating system materials is in accordance with CSM's instructions.

10. Inspect, confirm, and record that coating system materials' "pot life" is not exceeded during installation. Inspect to verify that recoat limitations for coating materials are not exceeded.
 11. Perform adhesion testing.
 12. Measure and record the coating system's thickness.
 13. Verify proper curing of the coating system in accordance with the CSM's instructions.
 14. Holiday or continuity testing in accordance with NACE SP0188 for coatings that will be immersed or exposed to aggressively corrosive conditions.
- C. Contractor shall perform holiday testing in accordance with NACE SP0188 to identify holidays or pinholes needing repair for coating over 100 percent of surfaces:
1. Coated steel that will be immersed or exposed to aggressively corrosive conditions.
 2. Coated concrete.
 3. Perform holiday tests after proper application and coating system cure.

3.14 CORRECTIVE MEASURES

- A. Repair pinholes or holidays identified by Holiday Testing as follows:
1. Remove the coating system with a grinder or other suitable power tool.
 2. Remove coating system at all pinholes and holidays at least 2 inches diameter around the defect back to expose substrate.
 3. Concrete voids: chip back to expose entire cavity in all directions.
 - a. Completely fill void with approved filler/surfacer material using a putty knife or other suitable tool, and strike off. Cure per CSM's recommendations.
 4. Aggressively abrade or sand the intact coating system surface at least 3 inches beyond the removal area in all directions to produce a uniform 6- to 8-mil profile in the intact coating system.
 5. Vacuum the prepared area to remove all dust, dirt, etc., leaving clean, sound surfaces.
 6. Tape to mask the periphery of the prepared intact coating area to prevent coating repair application onto the prepared area.
 7. Apply the coating system with enough coats to achieve the specified finish coat thickness over the defect and coating removal area. Feather the coating onto the abraded coated surfaces around the removal area to avoid a lip and to achieve a neat repair outline.
 8. Follow curing time between coats as specified by CSM for the site conditions. Solvent wash and abrasive blast per CSM's instructions, if the maximum recoat time is exceeded.
 9. Apply coating at specified dry film thickness.

3.15 CLEANUP

- A. Remove surplus materials, protective coverings, and accumulated rubbish after completing coating. Thoroughly clean surfaces and repair overspray or other coating-related damage.

3.16 FINAL INSPECTION

- A. Conduct final inspection of coating system work to determine whether it meets specifications requirements.
- B. Conduct subsequent final inspection with Engineer to ensure work conforms to contract documents requirements.
- C. Mark any rework required.
 - 1. Re-clean and repair, as specified, at no additional cost to the Owner.

END OF SECTION

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APPENDIX A
Schedule of Surfaces to be Coated

A. The following schedule is incomplete. Coat unlisted surfaces with same coating system as similar listed surfaces. Contact Engineer for clarification.

EPU-M-1	Metals, exterior, non-immersed	
EPX-M-2	Metals, interior, non-immersed	
EPX-M-3	Metals, immersed	
EPX-M-5	Aluminum surfaces in contact with concrete or masonry. Locations where Alkali-resistant bitumastic is specified.	
ACR-C-1		0
POL-C-1-BSC		0
EPU-FRP-1	FRP Ducts	
ACR-PVC-1	Exposed PVC and CPVC piping.	
Notes:		
<p>1: Non-immersed ferrous metal surfaces include:</p> <ul style="list-style-type: none"> a. Doors, doorframes, ventilators, louvers, grilles, exposed sheet metal, and flashing. b. Pipe, valves, pipe hangers, supports and saddles, conduit, cable tray hangers, and supports. c. Motors and motor accessory equipment. d. Drive gear, drive housing, coupling housings, and miscellaneous gear drive equipment. e. Valve and gate operators and stands. f. Structural steel. g. Crane and hoist rails. h. Exterior of tanks and other containment vessels. i. Mechanical equipment supports, drive units, and accessories. j. Bare electrical equipment: boxes, exposed conduit, and accessories. k. Pumps not submerged. l. Other miscellaneous metals. <p>2: Immersed ferrous metal surfaces include:</p> <ul style="list-style-type: none"> a. Interior surfaces of ferrous metal tanks. b. Field priming of ferrous metal surfaces with defective shop-prime coat; including non-submerged service. c. Bell rings, underside of manhole covers and frames. d. Sump pumps, including underside of base plates and submerged suction and discharge piping. e. Exterior of submerged piping and valves other than stainless steel or PVC piping. f. Submerged pipe supports and hangers. g. Stem guides. h. Other submerged iron and steel metal unless specified otherwise. 		

Appendix B
Coating Detail Sheet

Coating System	EPU-M-1		
Coating Material	Two coats epoxy with polyurethane finish coat		
Substrate	Metal		
Products	Primer	Intermediate Coat	Finish Coat
Carboline	Carboguard 890	Carboguard 890	Carbothane 134 VOC
International Paint	Devran 224V	Devran 224V	Devthane 379
PPG	Amercoat 385	Amercoat 385	Amercoat 450H
Sherwin Williams	Macropoxy 646	Macropoxy 646	Hi Solids Polyurethane
Tnemec	Series 66HS	Series 66HS	Series 1095
Service Condition	Interior or Exterior, subject to direct sunlight. Non-immersion.		
Surface Preparation			
General	Prepare surfaces as specified in this Section and as follows.		
Ferrous Metal	Bare surfaces: SSPC-SP10, Near-White Blast Cleaning. Shop primed surfaces: SSPC-SP2, Hand Tool Cleaning or SSPC-SP3, Power Tool Cleaning. Damaged primer or rust: SSPC-SP10, Near White Blast Cleaning and spot prime.		
Nonferrous Metal	SSPC-SP16, Brush Blast Cleaning.		
Galvanized Metal	SSPC-SP16, Brush Blast Cleaning. Test for surface contaminants.		
Surface profile			
Ferrous Metal	2.5 to 3.0 mils		
Nonferrous Metal	1.5 to 2.0 mils		
Galvanized Metal	1.5 to 2.0 mils		
System Thickness (Dry Film)			
Total	10 to 13 mils		
Primer	4 to 5 mils		
Intermediate Coat	4 to 5 mils		
Finish Coat	2 to 3 mils		
Application			
Special CTR Training	Not required.		

Appendix B
Coating Detail Sheet

Coating System	EPX-M-2		
Coating Material	Epoxy		
Substrate	Metal		
Products	Primer	Intermediate Coat	Finish Coat
Carboline	Carboguard 890	Carboguard 890	Carboguard 890
International Paint	Bar-Rust 236	Bar-Rust 236	Bar-Rust 236
PPG	Amerlock 2/400 Series	Amerlock 2/400 Series	Amerlock 2/400 Series
Sherwin Williams	Macropoxy 80	Macropoxy 80	Macropoxy 80
Tnemec	Series 66HS	Series 66HS	Series 66HS
Service Condition	Immersed, non-immersed, moderately corrosive environment.		
Surface Preparation			
General	Prepare surfaces as specified in this Section and as follows.		
Ferrous Metal	Bare surfaces: SSPC-SP5, White Metal Blast Cleaning. Shop primed surfaces: SSPC-SP7, Brush-Off Blast Cleaning. Damaged primer or rust: SSPC-SP5, White Metal Blast Cleaning and spot prime.		
Nonferrous Metal	SSPC-SP16, Brush-Off Blast Cleaning.		
Galvanized Metal	SSPC-SP16, Brush-Off Blast Cleaning.		
Surface profile			
Ferrous Metal	2 to 4 mils		
Nonferrous Metal	1.0 to 1.5 mils		
Galvanized Metal	1.0 to 1.5 mils		
System Thickness (Dry Film)			
Total	12 to 16 mils		
Primer	4 to 6 mils		
Intermediate Coat	4 to 6 mils		
Finish Coat	4 to 6 mils		
Application			
Special CTR Training	Not required.		

Appendix B
Coating Detail Sheet

Coating System	EPX-M-3		
Coating Material	Epoxy		
Substrate	Metal		
Products	Primer	Intermediate Coat	Finish Coat
Carboline	Carboguard 891	Carboguard 891	Carboguard 891
International Paint	Bar-Rust 236	Bar-Rust 236	Bar-Rust 236
PPG	Amercoat 240	Amercoat 240	Amercoat 240
Sherwin Williams	Macropoxy 80	Macropoxy 80	Tank Clad HS
Tnemec	Series 104	Series 104	Series 104
Service Condition	Immersed; non-immersed, corrosive environment. Not for Biogenic Sulfide Corrosion areas in wastewater.		
Surface Preparation			
General	Prepare surfaces as specified in this Section and as follows.		
Ferrous Metal	Bare surfaces: SSPC-SP5, White Metal Blast Cleaning. Shop primed surfaces: SSPC-SP7, Brush-Off Blast Cleaning. Damaged primer or rust: SSPC-SP5, White Metal Blast Cleaning and spot prime.		
Nonferrous Metal	SSPC-SP16, Brush-Off Blast Cleaning.		
Galvanized Metal	SSPC-SP16, Brush-Off Blast Cleaning.		
Surface profile			
Ferrous Metal	2.5 to 3.0 mils		
Nonferrous Metal	1.5 to 2.0 mils		
Galvanized Metal	1.5 to 2.0 mils		
System Thickness (Dry Film)			
Total	16 to 20 mils		
Primer	4 to 8 mils		
Intermediate Coat	4 to 8 mils		
Finish Coat	4 to 8 mils		
Application			
Special CTR Training	Not required.		

Appendix B
Coating Detail Sheet

Appendix B			
Coating Detail Sheet			
Coating System	EPX-M-5		
Coating Material	Epoxy mastic		
Substrate	Ferrous Metal		
Products	Primer	Intermediate Coat	Finish Coat
Carboline	CSM recommended	None applied	Carbomastic 15
International Paint	CSM recommended	Bar-Rust 231	Bar-Rust 231
PPG	CSM recommended	None applied	Amerlock 2 AL
Sherwin Williams	CSM recommended	None applied	Epoxy Mastic Aluminum II
Tnemec	CSM recommended	Series 135	Series 135
Service Condition	Interior, corrosive environment, confined enclosures, where minimal surface preparation is possible.		
Surface Preparation			
General	Prepare surfaces as specified in this Section and as follows.		
Ferrous Metal	Bare surfaces: SSPC-SP11, Power to Cleaning to Bare Metal. Shop primed surfaces: SSPC-SP3, Power Tool Cleaning. Damaged primer or rust: SSPC-SP11, Power to Cleaning to Bare Metal.		
Surface profile			
Ferrous Metal	2.0 to 2.5 mils		
System Thickness (Dry Film)			
Total	15 to 19 mils		
Primer	2 to 4 mils		
Finish Coat	15 mils		
Application			
Special CTR Training	Not Required.		

Appendix B
Coating Detail Sheet

Coating System	ACR-C-1		
Coating Material	Latex		
Substrate	Concrete, masonry, plaster, gypsum board		
Products	Primer	Intermediate Coat	Finish Coat
Carboline	Carbocrylic 120	Carbocrylic 3359	Carbocrylic 3359
International Paint	Devcryl 1440	Devcryl 1448	Devcryl 1448
PPG	Pitt Tech Primer	Pitt Tech	Pitt Tech
Sherwin Williams	Loxon Acrylic Primer	Sher Cryl HPA	Sher Cryl HPA
Tnemec	Series 1028 or 1029	Series 1028 or 1029	Series 1028 or 1029
Service Condition	Interior and exterior including existing exterior coated concrete.		
Surface Preparation			
General	Prepare surfaces as specified in this Section and as follows.		
Concrete	Cure at least 28 days and dry to the CSM's recommended moisture content. Remove loose concrete and laitance from surfaces, and repair voids and cracks as specified in this Section.		
Existing Coated Concrete	Remove all existing coating to a sound substrate or intact, well-adhered coating. Abrade all surfaces to achieve required surface profile and vacuum to remove all loose dirt, paint chips, and dirt.		
Masonry	Cure at least 28 days and dry to CSM's recommended moisture content. Fill holes or other joint defects with mortar and repoint. Scrape or chip to remove loose or splattered mortar. Wash and scrub masonry surfaces with clear water to remove foreign and deleterious substances. Do not use muriatic acid. Fill surfaces with block filler compatible with the specified primer after cleaning.		
Plaster	Ensure all plaster surfaces are dry, clean, and free from grit, loose plaster, and surface irregularities. Repair cracks and holes with acceptable patching materials, keyed to existing surfaces, and sandpaper smooth. Wash and scrub surfaces with clear water to remove foreign and deleterious substances. Seal surfaces with a compatible sealer after cleaning.		
Gypsum Wallboard	Sand smooth then dust tape joints and spackled nail heads. Seal with PVA sealer for interior uses only.		
Surface profile			
Concrete	0.5 to 1.5 mils		
Masonry	0.5 to 1.5 mils		
Plaster	0.5 to 1.5 mils		
Gypsum Wallboard	0.5 to 1.5 mils		
System Thickness (Dry Film)			
Total	4 to 6 mils		
Application			
General	Let sealer or filler dry at least 48 hours before primer application. Use CSM's recommended drying time between coats.		
Special CTR Training	Not Required.		

Appendix B
Coating Detail Sheet

Appendix B			
Coating Detail Sheet			
Coating System	POL-C-1-BSC		
Coating Material	Hybrid Polyurethane		
Substrate	Concrete or dense masonry		
Products	Primer	Intermediate Coat	Finish Coat
Global Eco Technologies	Endura-Flex EF 1200P	Endura-Flex EF 1988	Endura-Flex EF 1988
International Paint	Interseal 670HS LTC Buff	Polibrid 705	Polibrid 705
Sherwin Williams	Macropoxy 5500	Polycote 115	Polycote 115
Tnemec	Series 201	Series 406	Series 406
Service Condition	Interior or exterior, Immersed, non-potable; non-immersed, corrosive environment, biogenic sulfide corrosion, new or existing construction. Waterproofing in accordance with 07 10 00 for exterior of buried tanks.		
Surface Preparation			
General	Prepare surfaces as specified in this Section and as follows.		
Concrete	<p>Apply complete parge coat over all concrete surfaces after surface preparation is accepted. Completely fill all bugholes with the same material. Brush blast clean, if parge coat is non-polymer modified, after adequate cure per CSM's instructions to produce a uniform anchor pattern.</p> <p>Let concrete substrate cure under warm conditions (minimum of 75 degrees F) for at least 5 days before coating application if using wet abrasive or water jet surface preparation.</p> <p>Sawcut 1/4" minimum deep groove and provide coating termination and transition details as shown on the drawings and in accordance with CSM's standard details including terminations, transitions at corners, cracks, pipe penetrations, terminations at metal embedments, and other details.</p> <p>Vacuum all surfaces to be coated after surface preparation and curing to remove all loose dirt, dust, or other loose materials.</p>		
Existing Coated Concrete	Prepare as for new concrete. Apply a skim coat of a surfacer or filler material to restore the substrate to a smooth surface suitable for coating.		
Masonry	Prepare as for new concrete. Apply a skim coat of a surfacer or filler material to provide a smooth surface suitable for coating.		
Surface profile			
Concrete	ICRI CSP 5.		
Existing Coated Concrete	ICRI CSP 5.		
Masonry	ICRI CSP 3.		
System Thickness (Dry Film)			
Total	120-130 mils in addition to the parge coat.		
Primer	2-4 mils		
Intermediate and Finish Coats	Each coat at CSM's recommended DFT to specified system thickness.		
Application			
Special CTR Training	Required.		

Appendix B
Coating Detail Sheet

Appendix B			
Coating Detail Sheet			
Coating System	EPU-FRP-1		
Coating Material	Polyurethane		
Substrate	FRP		
Products	Primer	Intermediate Coat	Finish Coat
Carboline	Carbocrylic 120	None Applied	Carbothane 134 VOC
International Paint	Devran 210H/224V	None Applied	Devthane 378H
PPG	Amerlock 2/400 Series	None Applied	Amercoat 450 HS
Sherwin Williams	Macropoxy 646	None Applied	Hi Solids Polyurethane
Tnemec	Series 66HS	None Applied	Series 1095
Service Condition	Exterior, exposed to direct sunlight, non-immersed.		
Surface Preparation	Prepare surfaces as specified in this Section and as follows.		
General	Clean to remove loose dirt, dust, or other contaminants. Sand surfaces to achieve a uniform, roughened surface profile. Solvent clean and vacuum to remove loose debris.		
Surface profile	1.5 to 2.0 mils		
System Thickness (Dry Film)			
Total	4 to 7 mils		
Primer	2 to 4 mils		
Finish Coat	2 to 4 mils		
Application			
Special CTR Training	Not Required.		

Appendix B
Coating Detail Sheet

Appendix B			
Coating Detail Sheet			
Coating System	ACR-PVC-1		
Coating Material	Acrylic		
Substrate	PVC and CPVC pipe		
Products	Primer	Intermediate Coat	Finish Coat
Carboline	Carbocrylic 120	None Applied	Carbocrylic 3359
International Paint	Devcryl 1440	None Applied	Devcryl 1448
PPG	Pitt Tech Primer	None Applied	Pitt Tech
Sherwin Williams	Sher Cryl HPA	None Applied	Sher Cryl HPA
Tnemec	Series 1028 or 1029	None Applied	Series 1028 or 1029
Service Condition	Exterior, exposed to direct sunlight, non-immersed.		
Surface Preparation	Prepare surfaces as specified in this Section and as follows.		
General	Clean to remove loose dirt, dust, or other contaminants. Sand surfaces to achieve a uniform, roughened surface profile. Solvent clean and vacuum to remove loose debris.		
Surface profile	1.5 to 2.0 mils		
System Thickness (Dry Film)			
Total	4 to 8 mils		
Primer	2 to 4 mils		
Finish Coat	2 to 4 mils		
Application			
Special CTR Training	Not Required.		

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SECTION 10100

VISUAL DISPLAY BOARDS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Fixed, magnetic, optically clear, ghost-free, dry-erase markerboards.
- B. Related Requirements:
 - 1. Section 06100 – Rough Carpentry: Wood blocking and supports.

1.02 SCOPE

- A. Furnish tempered glass markerboards, stainless steel mounting hardware and anchors as necessary.

1.03 SUBMITTALS

- A. Section 01300 – Submittals: Requirements for submittals.
- B. Product Data: Submit manufacturer's product data, including installation instructions.
- C. Samples:
 - 1. Submit manufacturer's sample of markerboards.
- D. Maintenance Data: Submit manufacturer's certification that materials comply with specified requirements and are suitable for intended application.
- E. Cleaning Instructions: Submit manufacturer's cleaning instructions.
- F. Warranty Documentation: Submit manufacturer's standard warranty.

1.04 SUSTAINABLE DESIGN SUBMITTALS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
 - 1. Materials Resources Certificates:
 - a. Certify recycled material content for recycled content products.
 - 2. Indoor Air Quality Certificates:
 - a. Certify volatile organic compound content for each interior adhesive and sealant and related primer.

1.05 MAINTENANCE MATERIAL SUBMITTALS

- A. Section 01730 – Operation and Maintenance Manuals: Requirements for maintenance materials.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Delivery and Acceptance Requirements: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- B. Storage and Handling Requirements:
 - 1. Store and handle materials in accordance with manufacturer's instructions.
 - 2. Keep materials in manufacturer's original, unopened containers and packaging until installation.
 - 3. Store materials in clean, dry area indoors.
 - 4. Protect materials during storage, handling, and installation to prevent damage.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Fixed glass dry-erase markerboards: One of the following or approved equal:
 - 1. Luxor, Waukegan, IL (design basis)
 - 2. deko markerboards: www.dekomarkerboards.com
 - 3. Substitutions: Section 00700 – General Conditions.

2.02 SUSTAINABLE DESIGN SUBMITTALS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design submittals.
- B. Materials and Resources Characteristics:
 - 1. Recycled Content Materials: Furnish materials with maximum available recycled content.
- C. Indoor Environmental Quality Characteristics:
 - 1. Interior Adhesives: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.

2.03 COMPONENTS

- A. Product Attributes
 - 1. Ghost-free: impervious to staining from dry-erase, wet-erase and permanent markers.
 - 2. Shatterproof.
 - 3. Optically clear hard coating on face, permanent opaque color on back.
- B. Sizes and Weights:
 - 1. 48 inches x 96 inches: 117 lbs.
- C. Colors: As selected by Architect from full line of products from manufacturer.

- D. Surface: Does not absorb inks or stains, eliminates ghosting.
- E. Mounting: Provide manufacturer's mounting equipment and instructions.
- F. Accessories: Provide marker tray or equivalent accessory from manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Section 01400 – Quality Control Services: Requirements for installation examination.
- B. Do not begin installation until substrates have been properly prepared.
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

- A. Install markerboards in accordance with manufacturer's instructions at locations indicated on the Drawings.
- B. Install markerboards level, plumb, square, and true according to manufacturer's written instructions, and at the height indicated.
- C. Remove manufacturer's protective peel-coat prior to usage.

3.04 CLEANING

- A. Follow manufacturer's instructions.
- B. Do not use solvents, harsh chemicals, or abrasive cleaners on markerboard surface.

3.05 PROTECTION

- A. Protect installed products until completion of project
- B. Touch-up, repair or replace damaged products before Substantial Completion.

3.06 SCHEDULE

- A. Conference Room (110):
 - 1. One (1) 4'x8' markerboard with one (1) marker tray mounted at the board bottom center. Bottom of markerboard mounted at 32" a.f.f.
- B. Refer to Contract Drawings for more information regarding location and configuration.

END OF SECTION

SECTION 10400

SIGNAGE

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Plastic and metal signs for building and site use.

1.02 SUBMITTALS

- A. Product data.
- B. Shop drawings: Include lists of sign types, sizes, text, and colors; mounting details; locations; and cast metal plaque rubbings and templates.
- C. Samples: Include actual materials.
- D. Manufacturer's installation instructions.

1.03 SUSTAINABLE DESIGN SUBMITTALS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
 - 1. Materials Resources Certificates:
 - a. Certify recycled material content for recycled content products.
 - 2. Indoor Air Quality Certificates:
 - a. Certify volatile organic compound content for each interior adhesive and sealant and related primer.

1.04 QUALITY ASSURANCE

- A. Manufacturer qualifications: Manufacturer of proposed products for minimum 5 years with satisfactory performance record of minimum 5 years.
- B. Installer qualifications: Manufacturer approved installer of products similar to specified products on minimum 10 projects of similar scope as Project with satisfactory performance record.
- C. Regulatory requirements: Provide signage in accordance with Americans with Disabilities Act as published in the Federal Register, Volume 56, No. 144, Friday, July 26, 1991.

1.05 CASH ALLOWANCES

- A. Section 01020 - Allowances: Requirements governing allowances.

- B. Costs Included in Cash Allowances: Cost of product to Contractor or Subcontractor, less applicable trade discounts; delivery to Site and applicable taxes unless stated otherwise in Allowance Schedule.
- C. Costs Not Included in Cash Allowances but Included in Contract Sum/Price: Product handling at Site including unloading, uncrating, and storage; protection of products from elements and from damage; and labor for installation and finishing unless stated otherwise in Allowance Schedule.
- D. Architect/Engineer Responsibilities:
 - 1. Consult with Contractor for consideration and selection of products.
 - 2. Select products in consultation with Owner and transmit decision to Contractor.
 - 3. Prepare Change Order.
- E. Contractor Responsibilities:
 - 1. Assist Architect/Engineer in selection of products and suppliers.
 - 2. Obtain proposals from suppliers and offer recommendations.
 - 3. Upon notification of selection by Architect/Engineer and Owner, execute purchase agreement with designated supplier.
 - 4. Arrange for and process Shop Drawings, Product Data, and Samples. Arrange for delivery.
 - 5. Promptly inspect products upon delivery for completeness, damage, and defects. Submit claims for transportation damage.
- F. Differences in costs will be adjusted by Change Order.
- G. Allowance Schedule:
 - 1. Include the stipulated sum of \$500 for purchase and delivery of 15 additional metal safety signs as described in this specification with text to be decided during construction. Installation costs are included in Contract Sum/Price and not in allowance

PART 2 PRODUCTS

2.01 SUSTAINABILITY CHARACTERISTICS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design compliance.
- B. Materials and Resources Characteristics:
 - 1. Recycled Content Materials: Furnish materials with maximum available recycled content.
- C. Indoor Environmental Quality Characteristics:
 - 1. Interior Adhesives: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.

2.02 PLASTIC SIGNAGE SYSTEM

- A. Manufacturers:
 - 1. One of the following or equal:
 - a. Best Manufacturing Sign Systems, Montrose, CO; System 900013.
 - b. APCO Graphics, Atlanta, GA; equivalent product.
 - c. Vomar Products, Inc., Sepulveda, CA; equivalent product.
- B. Attachment:
 - 1. Vinyl tape, self-adhering.
- C. Lettering:
 - 1. Helvetica medium, 3/4 inches high.
- D. Material for interior use:
 - 1. Plastic 1/8-inch thick raised letters.
- E. Material for exterior use:
 - 1. Fiberglass 1/4 inch thick with high gloss finish, raised letters, blasted from single piece of fiberglass for integral letter and background.
 - 2. No adhesive as mechanical fastening of letters shall be allowed.
- F. Colors:
 - 1. As selected by Engineer from manufacturer's standard colors.
- G. See Schedule A for specific sign size, location, text, pictogram, and quantity.

2.03 METAL SAFETY SIGNS

- A. Manufacturer: Meeting OSHA Requirements; 40-mil thick aluminum with baked enamel finish. One of the following or equal:
 - 1. Seton Name Plate Co., Branford, Connecticut, Special Wording.
 - 2. Emedco, Buffalo, New York.
- B. Notice information signs:
 - 1. Background: White.
 - 2. Heading: White lettering on blue rectangular panel.
 - 3. Message: Black lettering.
 - 4. Size: As scheduled.
- C. Fasteners: Round head stainless steel bolts or screws.
- D. See Schedule B for specific sign size, location, text, and quantity.

2.04 CAST ALUMINUM LETTERS

- A. Manufacturers:
 - 1. One of the following or equal:
 - a. Southwell Company, Corpus Christi, TX.
 - b. OMC Industries, Bryan, TX.
- B. Material:
 - 1. Cast aluminum.

- C. Text size and font:
 - 1. As indicated on the Drawings.
- D. Finish:
 - 1. Black duranodic coating.
- E. Mounting:
 - 1. Projected jamb nut mounting, concealed.
- F. See Schedule C for specific size, location, text and quantity.

PART 3 EXECUTION

3.01 PREPARATION

- A. Protect adjacent surfaces which may be damaged by installation of signs.
- B. Prepare substrates in accordance with sign manufacturer's instructions.
- C. Remove scale, dirt, grease, and other contaminants from substrates.

3.02 INSTALLATION

- A. Install signs in accordance with sign manufacturer's instructions.
- B. Fasten signs securely in level, plumb, and true to plane positions.
- C. Install signs where indicated on the Drawings or as indicated in the following schedules.

3.03 SCHEDULES

- A. Plastic Signage System Schedule.
- B. Metal Safety Sign Schedule.
- C. Cast Aluminum System Schedule.

END OF SECTION

SCHEDULE A

PLASTIC SIGNAGE SYSTEM SCHEDULE

A. Room Numbers:

1. Location: On wall outside room adjacent to latch side of doors or when not enough space on latch side, on nearest adjacent wall.
2. Height: 60 inches above floor to center of sign.
3. Size: 6 inches square, unless shown otherwise on the Drawings.
4. Colors: As selected by the Engineer.
5. Text: Room number as indicated on the Drawings.

B. Room Numbers & Names:

1. Location: On wall outside room adjacent to latch side of doors or when not enough space on latch side, on nearest adjacent wall.
2. Height: 60 inches above floor to center of sign.
3. Size: 6 inches square, unless shown otherwise on the Drawings.
4. Colors: As selected by Engineer.
5. Text: Sign per door describing room function as indicated on the Drawings.

C. Restroom/Shower Doors:

1. Location: On wall outside room adjacent to latch side of doors or when not enough space on latch side, on nearest adjacent wall.
2. Height: 60 inches above floor to center of sign.
3. Size: 6 inches wide by 8 inches high, unless shown otherwise on the Drawings.
4. Colors: As selected by Engineer.
5. Pictogram: Toilet and shower symbols.
6. Text: Braille Characters and UNISEX.

D. Fire Extinguishers:

1. Location: Adjacent to fire extinguishers.
2. Height: 60 inches above floor to center of sign.
3. Size: 6 inches square, unless shown otherwise on the Drawings.
4. Colors: White letters on OSHA Red background.
5. Text: FIRE EXTINGUISHER.

END OF SCHEDULE A
PLASTIC SIGNAGE SYSTEM SCHEDULE

SCHEDULE B

METAL SAFETY SIGN SCHEDULE

E. STORAGE NOTICE:

1. Location: On interior side of door.
2. Height: 60 inches.
3. Size: 14 inches wide by 10 inches high.
4. Number: 7 signs total.
5. Heading: NOTICE
6. Wording: BY ORDER OF THE AUSTIN FIRE DEPARTMENT THIS ROOM SHALL NOT BE USED FOR STORAGE OF ANY KIND OR FOR ANY DURATION

F. NO SMOKING INFORMATIONAL SIGNS:

1. Location: On exterior face of wall, adjacent to each entry point (exterior door) to all buildings.
2. Height: 60 inches above floor to center of sign. Where metal safety signs are also located adjacent to entry points, place no smoking signs below these signs.
3. Size: 6 inches square.
4. Number: 7 signs total.
5. Heading: None.
6. Wording: None.
7. Pictogram: International "No Smoking" symbol.

G. ACCESSIBLE PARKING SIGN (POST MOUNTED AND REFLECTORIZED):

1. Location: Centered on the parking space reserved for persons with disabilities in accordance with UBC 1129B5.
2. Height: 60 inches from the bottom of sign to parking space finished grade, in accordance with UBC 1129B5.
3. Size: Not smaller than 70 square inches.
4. Number: 1 sign total.
5. Wording: As required to suit local regulations.
6. Pictogram: Symbol of accessibility in white on dark blue.

END OF SCHEDULE B
METAL SAFETY SIGN SCHEDULE

SECTION 10500

LOCKERS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Lockers.

1.02 SUBMITTALS

- A. Shop Drawings and Product Data: Include dimensions to adjacent surfaces, fillers, trim, base, accessories and numbering sequence.
- B. Samples: Include minimum 6-inch square sample of selected finish on actual substrate.
- C. Manufacturer's Installation Instructions.

1.03 SUSTAINABLE DESIGN SUBMITTALS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
 - 1. Materials Resources Certificates:
 - a. Certify recycled material content for recycled content products.

1.04 QUALITY ASSURANCE

- A. Provide lockers which are standard products of a single manufacturer and which have interchangeable parts including mounting accessories, fittings and fastenings.
- B. Manufacturer Qualifications: Manufacturer of proposed products for minimum 5 years with satisfactory performance record of minimum 5 years.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver metal lockers when building is enclosed and securable.

PART 2 PRODUCTS

2.01 SUSTAINABILITY CHARACTERISTICS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design compliance.

- B. Materials and Resources Characteristics:
 - 1. Recycled Content Materials: Furnish materials with maximum available recycled content.
- C. Greenguard: Lockers shall be GREENGUARD Gold Certified by UL Environment through the GREENGUARD Certification Program.

2.02 MANUFACTURERS

- A. Lockers: One of following or equal:
 - 1. Lyon Metal Products, Inc., Aurora, IL.
 - 2. Interior/MEDART Locker Co., Cleveland, OH.
 - 3. Penco Products, Inc., Greenville, NC.
 - 4. Republic Storage Products, LLC, Uniontown, OH.

2.03 LOCKERS

- A. Type: Single tier, 14 inches wide by 18 inches deep by 72 inches high.
- B. Sheet Steel: Commercial grade, mild annealed, cold rolled and stretcher leveled, with following thicknesses:
 - 1. Bodies and Shelves: Minimum 24 gauge.
 - 2. Door Frames: Minimum 16 gauge.
 - 3. Tops and Trim: Minimum 18 gauge.
 - 4. Sloped Tops: Minimum 20 gauge.
- C. Hinges: Minimum 2 inches high, 0.050 inch thick steel, 5 knuckle with spun over pin ends; 3 hinges per door.
- D. Fittings:
 - 1. Recessed locking handles with provisions for user furnished padlocks.
 - 2. 5/8-inch diameter coat rods
 - 3. Aluminum door number plates with embossed or etched, minimum 3/8 inch high numbers. Number sequence as directed.
 - 4. Rubber bumpers.
- E. Bodies: Formed and flanged.
- F. Door Frames: Formed channel shape, welded and ground flush.
- G. Doors: 1 piece with vertical edges channel shaped, top and bottom, flanged at 90-degree angle, 3 hinges welded to door and bolted to frame, and ventilation louvers at top and bottom.
- H. Shelves: flanged sides, front flanges turned 45 degrees for safety, in the following locations:
 - 1. Hat Shelves: Approximately 9 inches from top of each locker.
 - 2. Bottom Shelves: Approximately 18 inches from bottom of each locker.
- I. Bases: 4-inch high cabinet style closed section; capable of being anchored to floor with provisions for adjustment.

- J. Sloped Tops: Lengths as long as possible, but not less than 4 lockers long; slope at approximately 25 degrees; closed ends where exposed.
- K. Fasteners and Anchors: As recommended by locker manufacturer.
- L. Lockers are to be fully accessible per ADA/TAS 2012 standards.
- M. Finish:
 - 1. Preparation: Clean, degrease, and neutralize.
 - 2. Paint Materials and Application: Electrostatically sprayed with heavy coat high quality enamel and baked at 300 degrees Fahrenheit, capable of withstanding rigid hammer test without chipping and flanking.
 - 3. Color: As selected from manufacturer's standard colors.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that condition of substrates are satisfactory for installation of products.
- B. Take site measurements to verify adequacy of spaces for lockers.

3.02 PREPARATION

- A. Assemble locker units. Secure units together.

3.03 LOCKER INSTALLATION

- A. Install lockers in accordance with manufacturer's instructions.
- B. Install lockers plumb, level, rigid, and flush.
- C. Secure fastenings through backup reinforcing plates. Avoid metal distortion.
- D. Install trim, cabinet base, sloping top units, metal filler panels and end panels with flush, hairline joints using concealed fasteners.

3.04 ADJUSTING

- A. Adjust and lubricate locker doors and latches to operate easily without binding.
- B. Verify that integral latching devices are operating properly.

3.05 PROTECTION

- A. Touch up marred finishes that can be restored to factory-finished appearance.
- B. Use materials recommended or furnished by locker manufacturer.
- C. Replace damaged lockers that cannot be restored to factory-finished appearance with good, undamaged products.

END OF SECTION

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SECTION 10520

FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Fire extinguishers and cabinets.

1.02 SUBMITTALS

- A. Product Data.
- B. Manufacturer's Installation Instructions.

1.03 SUSTAINABLE DESIGN SUBMITTALS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
 - 1. Materials Resources Certificates:
 - a. Certify recycled material content for recycled content products.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer of proposed products for minimum 5 years with satisfactory performance record of minimum 5 years.
- B. Regulatory Requirements:
 - 1. Comply with UL requirements for classification type.
 - 2. Provide fire rated cabinet tubs where required to maintain fire rating of walls.

1.05 PROJECT CONDITIONS

- A. Sequencing and Scheduling:
 - 1. Coordinate installation of anchoring devices as specified in Section 09260 - Gypsum Board Assemblies. Coordinate preparation of openings for fire extinguisher cabinets in accordance with cabinet Manufacturer's.

PART 2 PRODUCTS

2.01 SUSTAINABILITY CHARACTERISTICS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design compliance.
- B. Materials and Resources Characteristics:
 - 1. Recycled Content Materials: Furnish materials with maximum available recycled content.

2.02 MANUFACTURERS

- A. Fire Extinguisher and Cabinets: One of the following or equal:
 - 1. J.L. Industries, Bloomington, MN.
 - 2. Larsen's Manufacturing Company, Minneapolis, MN.
 - 3. Modern Metal Products by Muckle, Owatonna, MN.

2.03 FIRE EXTINGUISHERS

- A. Type FE05: UL 2A:10B:C with 5-pound capacity of dry chemical with ammonium phosphate base for extinguishing ABC fires.
- B. Type FE10: UL 4A:60B:C with 10-pound capacity of dry chemical with ammonium phosphate base for extinguishing ABC fires.
- C. Type FE20: UL 20A:120B:C with 20-pound capacity of dry chemical with ammonium phosphate base for extinguishing ABC fires.
- D. Type EFE10: UL 1A:10B:C with 10-pound capacity of colorless, odorless, electrically non-conductive liquefied gas, or clean agent as defined by NFPA 2001, for extinguishing electrical fires without leaving residue.
- E. Type EFE15: UL 2A:10B:C with 15-pound capacity of colorless, odorless, electrically non-conductive liquefied gas, or clean agent as defined by NFPA 2001, for extinguishing electrical fires without leaving residue.

2.04 WALL BRACKETS

- A. Type: Standard as manufactured by fire extinguisher Manufacturer.

2.05 FIRE EXTINGUISHER CABINETS

- A. Manufacturers: One of the following or equal:
 - 1. J. L. Industries.
- B. Cabinets: Semi-recessed as indicated; stainless steel at wet areas, steel elsewhere:
 - 1. Tub:
 - a. Trim: Recessed, 1-1/4 inch face trim.
 - b. Material: Cold-rolled steel.
 - c. Finish: Semi-gloss epoxy, white.
- C. Door:
 - 1. Type: Clear Vu Series.
 - 2. Style: Full acrylic.
 - 3. Glazing: Clear bubble, 1/8 inch thick.
 - 4. Stiles and Rails: 1 inch wide.
 - 5. Metal Material: Same as for tub.
 - 6. Metal Finish: Same as for tub.
 - 7. Pull: MANUFACTURER'S standard.
 - 8. Catch: Self-adjusting roller type.

2.06 OPERATING HARDWARE

- A. Hinges: Continuous heavy duty hinge.

2.07 ACCESSORIES

- A. Extinguisher Brackets: Formed steel, corrosion resistant finish, size and type to suit extinguisher.
- B. Cabinet Signage: Black painted lettering, 1-inch high, indicating cabinet function; "FIRE EXTINGUISHER". Place lettering vertically on hinge side of door.
- C. Cabinet Mounting Hardware: Appropriate to cabinet.
- D. Fasteners: Fasteners exposed in the final installation, with the door open and closed, shall be tamper-proof fasteners.

2.08 FABRICATION

- A. Form cabinet enclosure with right angle inside corners and seams. Form perimeter trim.
- B. Pre-drill for anchors.
- C. Hinge doors for 180-degree opening.
- D. Weld, fill, and grind components smooth.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install products in accordance with Manufacturer's recommendations.
- B. Install products plumb, square and level.
- C. Place Extinguishers: Locate 1 extinguisher in each cabinet and elsewhere as indicated.

3.02 SCHEDULE

- A. Install fire extinguisher on wall brackets when fire extinguisher are indicated without cabinets.
- B. Install fire extinguisher in cabinets when fire extinguisher cabinets are indicated.
- C. Install extra fire extinguishers with brackets where directed by the Engineer.

**FIRE EXTINGUISHER SIZE AND PLACEMENT CRITERIA
(PER NFPA 10)**

For Class A Hazards			
	Light Hazard Occupancy	Ordinary Hazard Occupancy	Extra Hazard Occupancy
Minimum Rated Single Extinguisher	2-A	2-A	4-A
Maximum floor area per unit A	3,000 sq. ft.	1,500 sq. ft.	1,000 sq. ft.
Maximum floor area for extinguisher	11,250 sq. ft.	11,250 sq. ft.	11,250 sq. ft.
Maximum travel Distance to extinguisher	75 feet	75 feet	75 feet

For Class B Hazards		
Type of Hazard	Minimum Extinguisher Rating	Maximum Travel Distance to Extinguisher (feet)
Light (Low)	5-B	30
	10-B	50
Ordinary (Moderate)	10-B	30
	20-B	50
Extra (High)	40-B	30
	80-B	50

For Class C Hazards

Class C ratings are required where energized electrical equipment is encountered. Since fire itself is a class A or B hazard, the extinguishers are sized and located on the Basis of the Class A or B hazard.

Installation of Fire Extinguishers

Extinguishers must be installed on the hangers or in the brackets supplied, mounted in cabinets, or set on shelves, except when the extinguishers are the wheeled type.

Extinguishers having a gross weight up to 40 pounds shall be installed so the top of the extinguisher is not more than 5 feet above the floor.

Extinguisher having a gross weight of more than 40 pounds shall be installed so that the top of the extinguisher is not more than 3'-6" above the floor.

END OF SECTION

SECTION 10615

DEMOUNTABLE PARTITIONS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Non-progressive, moveable and reconfigurable system of unitized panels, from a single manufacturer.

1.02 RELATED SECTIONS

- A. Section 06100 – Rough Carpentry: Wood framing for adjacent substrates.
- B. Section 09260 – Gypsum Board Assemblies: Adjacent partition and fur down substrates.

1.03 REFERENCE STANDARDS

- A. Aluminum Association:
 - 1. AA DAF45-R03, Designation System for Aluminum Finishes, 9th Edition
- B. American National Standards Institute
 - 1. ANSI Z97.1-2004, Safety Glazing Materials Used in Buildings – Safety Performance Specifications and Method of Test.
- C. ASTM International:
 - 1. ASTM B221-06, Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profile and Tubes
 - 2. ASTM C1036, Standard Specification for Flat Glass
 - 3. ASTM E72, Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.
 - 4. ASTM E1300, Standard Practice for Determining Load Resistance of Glass in Buildings
- D. The Business and Institutional Furniture Manufacturers Association (BIFMA):
 - 1. BIFMA M7.1 Standard Test Method for Determining VOC Emissions.
 - 2. BIFMA X5.6 – Panel Systems.
- E. Consumer Product Safety Commission:
 - 1. Regulation 16 CFR 1201, Safety Standard for Architectural Glazing Materials.
- F. International Code Congress:
 - 1. International Building Code – 2015.
- G. International Organization for Standardization:
 - 1. ISO 9001 – Quality Management System.

1.04 SUBMITTALS

- A. Section 01300 – Submittals: Requirements for submittals.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation instructions.
 - 4. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of demountable partition.
 - 5. Care and Maintenance Standards: For demountable partitions to include in maintenance manuals.
- C. Shop drawings:
 - 1. For demountable partitions. Include plans, elevations, sections, details, and attachments to other work.
 - a. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - b. Indicate partition layout, including doors and hardware, elevations, opening locations, special panels and conditions at adjacent construction.

1.05 SUSTAINABLE DESIGN SUBMITTALS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify that the products meet or exceed specified sustainable design requirements.
 - 1. Materials Resources Certificates:
 - a. Certify recycled material content for recycled content products.
 - 2. Indoor Air Quality Certificates:
 - a. Certify volatile organic compound content for each interior adhesive and sealant and related primer.
 - b. Certify volatile organic compound content for each interior paint and coating.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 - 1. All primary products specified within this section will be supplied by a single manufacturer with a minimum of ten (10) years' experience. The manufacturer of the wall system shall operate under an ISO 9001 certified quality management system.
- B. Installer Qualifications:
 - 1. All products listed within this section shall be installed by a manufacturer-certified installation company.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver demountable partition system components cartoned or crated to provide protection during direct transit to site or intermediary location. Components shipped from intermediary location to site shall be protected as required to provide protection during transit.
- B. Inspect demountable partition system components for damage upon delivery to site and to intermediary location.
- C. Minor damages may be repaired, provided finish items are equal to new work and acceptable to Architect. Remove and replace damaged items as directed.
- D. Store demountable partition system components on raised platforms with blocking between units to allow air circulation. Keep stored material covered and protected from damage.

1.08 WARRANTY

- A. Warranty period: Ten (10) years from date of substantial completion.

1.09 EXISTING CONDITIONS

- A. Field Measurements: Verify field measurements prior to fabrication. Indicate field measurements on Shop Drawings.
- B. Finished Spaces: Do not deliver or install demountable partition components until building is enclosed and finishing operations, including installation of light fixtures, and HVAC equipment are complete

PART 2 PRODUCTS

2.01 SUSTAINABILITY CHARACTERISTICS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design compliance.
- B. Material and Resource Characteristics:
 - 1. Recycled Content Materials: Furnish materials with maximum available recycled content.
- C. Indoor Environmental Quality Characteristics:
 - 1. Interior Anti-Corrosive Paints: Maximum volatile organic compound content according to GC-03.

2.02 MANUFACTURERS

- A. Demountable partitions: One of the following or equal:
 - 1. Haworth, Inc., Enclose, Holland, MI.
 - 2. Partition Systems, Corporate, Edmonton, Alberta, Canada.

2.03 MATERIALS

- A. Core Framing Components: Manufacturer's standard, extruded aluminum ASTM B221, within manufacturer's tolerance and free from defects impairing strength and/or durability.
- B. Glass and Glazing Materials:
 - 1. Glazing: Glass type as indicated by Architect complying with Division 08 Section "Glazing".
 - a. Minimum thickness: 1/4" (6mm)
 - b. Maximum thickness: 3/8" (10mm)
 - c. Glazing sections: Resilient ABS, extruded glazing section to suit glazing channel retaining slot placed into demountable partition system for setting glass.

2.04 UNITIZED PANEL TYPES

- A. Solid Panels:
 - 1. Core Framing Components: Extruded aluminum minimum 0.05" (1.3mm) thick, stile and frame with corner brackets, installed for full frame rigidity.
 - 2. Panel Types:
 - a. Monolithic: 3/8" (10mm) thick glass pane, Tempered, ceiling height, fit to frame with ABS glazing gaskets.

2.05 DOORS, DOOR FRAMES AND HARDWARE

- A. Sliding Doors: Manufacturer's standard 3/8" (10mm) thick Glass slab.
 - 1. Door Finishes: Fully tempered clear float glass
 - 2. Door Glass Thickness:
 - a. Glass Slab – Manufacturer's standard, 3/8" (10mm)
 - 3. Texture and Pattern:
 - a. Frosted glass, velour finish.
- B. Accessory Hardware:
 - 1. Sliding Doors:
 - a. Glass Slab Doors – Adjustable bottom plinth C-Channel track
 - b. Sliding Door Lock – Meets ADA requirements.
 - c. Sliding Door Panel Stop – by manufacturer.
- C. Door Glazing: Fully tempered frosted float glass.
 - 1. Maximum thickness 3/8-inch (10 mm)
 - 2. Minimum and maximum values do not apply to doors.

2.06 FABRICATION

- A. Fabricate demountable partition system off-site in a controlled factory environment and deliver panels fully finished to site for installation with no additional assembly, construction or finishing required.
- B. Fabricate demountable walls for installation with concealed fastening devices and pressure-fit members. Fabricate systems to accept installation of PVC-free continuous light and sound seals at floor, ceiling, and other locations where partitions abut fixed construction.

2.07 CONNECTION METHODS

- A. Demountable Partition System to Fixed-in-Place Construction: Extruded aluminum wall starter with PVC-free light and sound seal at all abutments between demountable partition system and fixed-in-place construction.
- B. Panel to Panel, Door Frame or Post Connector: Continuous, extruded ABS connector applied to aluminum frame providing a 5/16" (8mm) reveal, recessed 3/16" (5mm) from panel face and ensuring integrity of light and sound seal.
- C. Panel Face to Frame: Continuous, extruded ABS retention clip affixed to back of panel face secured to aluminum frame.
- D. Exposed Ends and Corners: Supply and install one-piece aluminum extrusion to match panel finish, attached to end panel with standard panel-to-panel connector.

2.08 FINISHES

- A. Aluminum Surfaces: Finish exposed surfaces of aluminum components Class 1 clear anodized. Non-repairable, anodized aluminum finishes are unacceptable.
- B. ABS Extrusions: Selected from manufacturer's samples.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive Work.
- B. Verify that concealed blocking and reinforcement is installed and correctly located to receive wall-mounted handrails.

3.02 PREPARATION

- A. Prior to installation of demountable partition system, clean floor to remove dust, debris, and loose particles.
- B. Illuminate areas of installation to provide an ambient light level of at least 100 foot candles measured in the area where partitions are to be installed.
- C. Maintain temperature in the area of installation at a constant minimum of 65 degrees Fahrenheit with relative humidity less than 70 percent for a period of 48 hours prior to installation and during the installation process.
- D. General Contractor will deliver all construction interfacing with the demountable partition system in true and plumb condition.

- E. For manufacturer to accept responsibility of dimensional compatibility between demountable partition wall system and construction, manufacturer shall have access to the completed site for accurate field measuring six (6) weeks prior to requiring product on site to commence installation. If timeline does not permit the six (6) weeks lead time, demountable manufacturer shall provide “hold-to” dimensions for the General Contractor. General Contractor then assumes responsibility that construction delivers on “hold to” dimensions.

3.03 INSTALLATION

- A. Install the demountable partition system under manufacturer’s approved, direct supervision to ensure performance and compatibility with design and specification intent.
- B. Install demountable partition systems rigid, level, plumb, and aligned. Install seals to prevent light and sound transmission at connections to floors, ceilings, fixed walls, and abutting surfaces.
 - 1. Installation Tolerance: Install each demountable partition so surfaces vary not more than 1/8 inch (3 mm) from the plane formed by the faces of adjacent partitions.
- C. Install door-and-frame and glazing-and-glazing-frame assemblies securely anchored to partitions and with doors aligned and fitted. Install and adjust door hardware for proper operation

3.04 DEMONSTRATION

- A. Engage a factory-authorized service representative to demonstrate and train Owner's maintenance personnel to adjust, operate, and maintain demountable partitions.

3.05 PROTECTION

- A. Refer to Section 01600 – Product Requirements.
- B. Protect installed demountable partition system components until completion of project.
- C. Touch-up, repair or replace damaged moveable wall system components before Substantial Completion

3.06 ATTACHMENTS

- A. Demountable partitions at Rooms 102, 103, 107 and 111.
- B. Reference Drawings from more information

END OF SECTION

SECTION 10810
TOILET ACCESSORIES

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Toilet accessories.

1.02 REFERENCES

- 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:
1. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 2. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 3. ASTM A269 - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
 4. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 5. ASTM A666 - Standard Specification for Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
 6. ASTM B456 - Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.
 7. ASTM C1036 - Standard Specification for Flat Glass.
- C. Federal Specification Unit:
1. FS A-A-3002 - Mirrors, Glass.
- D. Forest Stewardship Council:
1. FSC Guidelines - Forest Stewardship Council Guidelines.
- E. Green Seal:
1. GC-03 - Anti-Corrosive Paints.
 2. GS-11 - Product Specific Environmental Requirements.
- F. South Coast Air Quality Management District:
1. SCAQMD Rule 1168 - Adhesive and Sealant Applications.

1.03 SUBMITTALS

- A. Shop Drawings: Include schedule of proposed products.

- B. Product Data: Include dimensions gauge, profiles, materials, fabrication details, manufacturer's installation instructions including setting drawings where cutouts are required, templates, substrate preparation instructions and directions for preparing cutouts for installation of accessories.
- C. Special Samples: Include 1 of each accessory type. Special samples acceptable to Engineer may be installed in the Work.

1.04 SUSTAINABLE DESIGN SUBMITTALS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
 - 1. Materials Resources Certificates:
 - a. Certify recycled material content for recycled content products.
- C. Indoor Air Quality Certificates:
 - 1. Certify volatile organic compound content for each interior adhesive and sealant and related primer.
 - 2. Certify volatile organic compound content for each interior paint and coating.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer of proposed products for minimum 5 years with satisfactory performance record of minimum 5 years.
- B. Installer Qualifications: Manufacturer approved installer of products similar to specified products on minimum 5 projects with satisfactory performance record. Furnish toilet accessories by one manufacturer, unless scheduled otherwise.
- C. Requirements of Regulatory Agencies: Conform to applicable requirements of ADA and Texas Accessibility Standards for provisions for the physically handicapped; materials and installation.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Maintain protective coatings or coverings on units until installation is complete.

1.07 PROJECT CONDITIONS

- A. Sequencing and Scheduling:
 - 1. Coordinate the Work with placement of internal wall reinforcement and reinforcement of toilet partitions to receive anchor attachments.

PART 2 PRODUCTS

2.01 SUSTAINABILITY CHARACTERISTICS

- A. Section 01352 – Sustainable Construction Requirements: Requirements for sustainable design compliance.

- B. Materials and Resources Characteristics:
 - 1. Recycled Content Materials: Furnish materials with maximum available recycled content.
- C. Indoor Environmental Quality Characteristics:
 - 1. Interior Adhesives: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.
 - 2. Interior Flat and Non-Flat Paints: Maximum volatile organic compound content in accordance with GS-11.
 - 3. Interior Anti-Corrosive Paints: Maximum volatile organic compound content in accordance with GC-03.

2.02 MANUFACTURERS

- A. Toilet Accessories: One of following or equal:
 - 1. Bobrick Washroom Equipment Co., Inc., North Hollywood, CA.
 - 2. General Accessory Manufacturing Co., Durant, OK.
 - 3. Watrous, Div. of Lansbrie Corp., Northbrook, IL.

2.03 MATERIALS

- A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
 - 1. Grind welded joints smooth.
 - 2. Fabricate units made of metal sheet of seamless sheets, with flat surfaces.
- B. Keys: Furnish 2 keys for each accessory to Owner; master key all accessories.
- C. Stainless Steel Tubing: ASTM A269, stainless steel.
- D. Stainless Steel: ASTM A240, Type 304 or 316; minimum 28 gauge.
- E. Mirror Glass: Float glass, Type I, Class 1, Quality q2 (ASTM C 1036), with silvering, copper coating, and suitable protective organic coating to copper backing in accordance with FS A-A-3002.
- F. Adhesive: Two component epoxy type waterproof.
 - 1. Interior Adhesives: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.
- G. Fasteners, Screws, and Bolts: Hot dip galvanized, tamper-proof and security type.
- H. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.04 TOILET ACCESSORIES

- A. Manufacturer: Bobrick Washroom Equipment Co., Inc.
 - 1. Or equivalent products from manufacturers listed above.

- B. Types:
1. Toilet Paper Dispenser: Surface Mounted for 2 rolls B-274.
 2. Grab Bars (non-shower locations): B-6806; concealed fasteners; satin finish; sizes and shapes indicated, with appropriate anchors.
 3. Shower Grab Bars: B-6861; concealed fasteners; satin finish.
 4. Shower Curtain Rod: B-207x36; concealed mounting.
 5. Folding Shower Seat: B-5181
 6. Mirror with 1/2 by 1/2 Inch Frame: B-165, sizes as indicated on the Drawings.
 7. Mop and Broom Holder: B-224 x 36 inches, 4 holders.
 8. Paper Towel Dispenser/Waste Receptacle, Semi-Recessed, Plastic Liner: B-3940.
 9. Soap Dispenser: B-2111; Surface Mounted; Liquid Soap, with 40 fluid ounce capacity.
 10. Hat and Coat Hook: B-682; Surface mounted.
- C. Fasteners: Concealed or tamperproof, sized to suit application.

2.05 FABRICATION

- A. Weld and grind smooth joints of fabricated components.
- B. Form exposed surfaces from single sheet of stock, free of joints.
- C. Form surfaces flat without distortion. Maintain flat surfaces without scratches or joints.
- D. Shop assemble components and package complete with anchors and fittings.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that conditions are satisfactory for the installation of accessory items.
- B. Verify that supports and reinforcements are in place and proper for accessory installation.
- C. Do not begin installation until conditions are satisfactory. Beginning installation means acceptance of existing conditions.

3.02 PREPARATION

- A. Deliver inserts and rough-in frames to site at the appropriate time for building-in.
- B. Provide templates and rough-in measurements as required.

3.03 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install units plumb and level. Firmly anchor accessories.

- C. Install grab bar connectors or support angles between studs securely enough to withstand horizontal pull of 300 pounds.
- D. Accurately position grab bar connector assemblies and tighten to support angles before application of wall finish. After completion of wall surface, secure concealed mounting plate to connector assembly with stainless steel machine screws.
- E. Use through-bolted connection for grab bars on toilet compartments.

3.04 ADJUSTING

- A. Adjust accessories for proper operation and verify that mechanisms operate smoothly.
- B. Replace damaged or defective products with good products.

3.05 SCHEDULES

- A. Administration Building: As shown on Drawings.

END OF SECTION

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SECTION 10910

LOUVERS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Stationary weather louvers.

1.02 REFERENCES

- A. Air Movement and Control Association International, Inc. (AMCA):
 - 1. 500-L - Laboratory Methods of Testing Louvers for Rating.
 - 2. 500-D - Laboratory Methods of Testing Dampers for Rating.
 - 3. 511 - Certified Ratings Program - Product Rating Manual for Air Control Devices.
- B. ASTM International (ASTM):
 - 1. D4385 – Standard Practice for Classifying Visual Defects in Thermosetting Reinforced Plastic Pultruded Products.
- C. Underwriters Laboratories, Inc. (UL).

1.03 PERFORMANCE REQUIREMENTS

- A. Performance: In accordance with AMCA 511 when tested in accordance with AMCA 500.
- B. Designed for 20 pounds per square foot wind load.

1.04 SUBMITTALS

- A. As specified in Section 15050 - Common Work Results for Mechanical Equipment.

1.05 QUALITY ASSURANCE

- A. Provide louvers with the following, unless otherwise specified:
 - 1. AMCA certification and rating in accordance with AMCA 511 for air performance and water penetration.

PART 2 PRODUCTS

2.01 GENERAL

- A. Louver types: Louvers are marked on the drawings with a letter L followed by a number referring to a louver type in this Section. Individual louver size and airflow rates are as indicated on the Drawings.

- B. Accessories:
 - 1. Provide installation clips and flanged or jamb-mounting styles suitable for the mounting locations as indicated on the Drawings.
 - 2. Provide extended sills for louvers indicated as installed recessed from the exterior wall surface.
 - 3. Provide stainless steel fasteners unless noted otherwise.
 - 4. Corrosion protection.
 - 5. Provide gravity damper for all outside air intake and exhaust louvers unless noted otherwise.

- C. Protective coatings for aluminum in contact with concrete or masonry:
 - 1. Manufacturers: One of the following or equal:
 - a. Koppers Co., Inc.
 - b. Tarmastic 100.
 - c. Porter Coatings.

2.02 STATIONARY WEATHER LOUVERS, TYPE L-1

- A. Manufacturers: One of the following or equal:
 - 1. Greenheck, Model ESD-603
 - 2. Ruskin, Model ELF 6375DXH
 - 3. Airolite Co., equivalent product.

- B. Requirements:
 - 1. Type: Stationary louver with drainable blades.
 - 2. Frame: 6 inches deep, minimum 0.125-inch thick, Type 6063-T5 aluminum with downspouts and caulking channel provided.
 - 3. Blades: Minimum 0.125-inch thick, Type 6063-T5 aluminum drainable blades spaced at 6-inch centers, stationary mounted at 37 degrees.
 - 4. Screens: Removable aluminum frame with aluminum wire; insect screens on intakes and bird screens on exhausts.
 - 5. Pressure drop (without screen): Maximum 0.05-inch water column for exhaust service and 0.05-inch water column for intake service at 1,000 feet per minute free area velocity.
 - 6. Water penetration: Maximum 0.01-ounce water per square foot at 1,027 feet per minute free area velocity.
 - 7. Mullions: Hidden.
 - 8. Finish: Kynar finish; color selected by owner.

PART 3 EXECUTION

3.01 INSTALLATION

- A. As specified in Section 15050 - Common Work Results for Mechanical Equipment.

END OF SECTION