December 12, 2024

ADDENDUM #1

TO CONTRACT DOCUMENTS FOR:	Project #CP231541 – Virginia Avenue Substation and Underground Ductbank
ADVERTISEMENT DATE:	November 21, 2024
PREPARED FOR:	The Curators of the University of Missouri
CONSULTANT:	Jacobs Engineering Group, Inc. 777 Main Street, 23rd Floor Fort Worth, Texas 76102

The contract documents for the above noted project and the work covered thereby and herein modified.

GENERAL INFORMATION:

1) The bid opening date is being extended to **January 21, 2025** at 1:30 pm. All other provisions of the Advertisement for Bids remain unchanged.

PROJECT MANUAL(VOLUME 1):

1) Replace existing TABLE OF CONTENTS with attached updated TABLE OF CONTENTS
2) ADVERTISEMENT FOR BIDS: First paragraph, revise to read "…until 1:30 p.m., C.T., January 21, 2025 and then immediately opened and publicly read aloud."
3) Insert attached Section 1.E.6 – Commissioning Plan
4) SWPPP Appendix C, SWPPP Details, add the following comment: "SWPPP Details can be found on Sheets C-111 and C-112 of the Project Drawings.
5) SWPPP Appendix D, SWPPP Site Plan, add the following comment: "SWPPP Site Plan can be found on Sheets C-101 and C-102 of the Project Drawings.
6) Replace Section 034100 – PRECAST STRUCTURAL CONCRETE
7) Replace Section 057500 – GRAPHIC PERFORATED ALUMINUMWALL PANELS
8) Replace Section 066400 – PLASTIC PANELING
9) Replace Section 071113 – SELF-ADHERING WATERPROOFING
10) Replace Section 079100 – PREFORMED JOINT SEALS
11) Replace Section 099113 – EXTERIOR PAINTING
12) Replace Section 099123 – INTERIOR PAINTING
13) Replace Section 102800 – TOILET, BATH, AND LAUNDRY ACCESSORIES
14) Delete Section 071326 – SELF-ADHERING SHEET WATERPROOFING

15) Delete Section 071350 – PRE-APPLIED SHEET MEMBRANE WATERPROOFING
16) Delete Section 071413 – HOT APPLIED WATERPROOFING
17) Delete Section 122113 – HORIZONTAL LOUVER BLINDS

PROJECT MANUAL (VOLUME 2):

1) Replace existing TABLE OF CONTENTS with attached updated TABLE OF CONTENTS
2) Replace Section 224100 – PLUMBING FIXTURES
3) Replace Section 260916 – ELECTRICAL CONTROLS AND RELAY PANELS
4) Delete Section 133419 – METAL BUILDING SYSTEMS

DRAWINGS:

1) Architectural: Replace following Rev A drawings with attached Rev B drawings:
   A-102 A-200 A-201 A-202 A-501
2) Plumbing: Replace Follow Rev A drawings with attached Rev B drawings:
   P-101 P-105
3) Electrical: Replace the following Rev A drawings with attached Rev B drawings:
   E-071 E-512 E-513 E-807 ES-100 ES-101

PROJECT MANUAL FOR: GENERAL SITE – VIRIGINIA AVENUE SUBSTATION AND UNDERGROUND DUCTBANK

PROJECT NUMBER: CP231541

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099113	EXTERIOR PAINTING
099123	INTERIOR PAINTING
DIVISION 10	SPECIALTIES
102800	TOILET, BATH AND LAUNDRY ACCESSORIES
DIVISION 11	NOT USED
DIVISION 12	NOT USED
DIVISION 13	NOT USED
DIVISION 14	NOT USED
DIVISION 21	NOT USED

PROJECT MANUAL FOR: GENERAL SITE – VIRIGINIA AVENUE SUBSTATION AND UNDERGROUND DUCTBANK

PROJECT NUMBER: CP231541

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DIVISION 27	COMMUNICATIONS OPTICAL FIBER BACKBONE CABLING
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DIVISION 28	NOT USED

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333100	SANITARY UTILITY SEWERAGE PIPING
334100	STORM UTILITY DRAINAGE PIPING
334600	SUBDRAINAGE
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337100	MAIN ELECTRICAL SUPPLY STATION
337126	CURRENT LIMITING AIR CORE REACTOR
337213	SUBSTATION AND TRANSMISSION STEEL STRUCTURES
337520	72.5 kV SF6 CIRCUIT BREAKERS

CP231541 Gen.Site Virginia Ave Sbstatn and Undrgrd Bank Commissioning Check List

Commissioning Items by CSI Division	Verified by: Name	Firm	Date compl	Coord Initial	Documentation Required	Owner Witness Required
1						
Building System Commissioning						
Commissioning Agent - Conduct pre-installation meetings per specifications.						☑
15713						
Temporary Erosion and Sediment Control and SWPPP						
Install and maintain. Inspect to ensure integrity.					Inspection Reports	☑
24119						
Selective Demolition						
Maintain dust control while demolishing.						☐
Return adjacent areas to condition existing before demolition operations began					Pre-construction video or digital photos	☐
31000						
Concrete Forming and Accessories						
Hold Preinstallation Conference as specified					Meeting Minutes	☑
Perform Field Quality Control section of specifications					Test Report	☑

Commissioning Items by CSI Division	Verified by: Name	Firm	Date compl	Coord Initial	Documentation Required	Owner Witness Required
32000						
Concrete Reinforcing						
Hold Preinstallation Conference as specified					Meeting Minutes	☑
Perform Field Quality Control section of specifications					Test Report	☑
33000						
Cast-in-Place Concrete						
Hold Preinstallation Conference as specified					Meeting Minutes	☑
Perform Field Quality Control section of specifications					Test Report	☑
Provide a Copy Of Field Cured Concrete Cylinder Test Report to Owner's Rep Prior to Stripping Any Load Bearing Formwork					Test Report From Independent Testing Lab	☐
34100						
Precast Structural Concrete						
Hold Preinstallation Conference as specified					Meeting Minutes	☑
Perform Field Quality Control section of specifications					Test Report	☑
34500						
Precast Architectural Concrete						
Build Mockups as specified					Inspection Report	☑

Commissioning Items by CSI Division	Verified by: Name	Firm	Date compl	Coord Initial	Documentation Required	Owner Witness Required
Perform Field Quality Control section of specifications					Test Report	☑
42000						
Unit Masonry						
Hold Preinstallation Conference as specified					Meeting Minutes	☑
Perform Field Quality Control section of specifications					Test Report	☑
Provide mock-ups per specifications.					Inspection Report	☑
51200						
Structrual Steel Framing						
Hold Preinstallation Conference as specified					Meeting Minutes	☑
Perform Field Quality Control section of specifications					Test Report	☑
Provide welder qualification report for each welder on site					Welder Qualifications	☑
53100						
Steel Decking						
Perform Field Quality Control section of specifications					Test Report	☑

Commissioning Items by CSI Division	Verified by: Name	Firm	Date compl	Coord Initial	Documentation Required	Owner Witness Required
55000						
Metal Fabrications						
Provide welder qualification report for each welder on site					Welder Qualifications	☑
55113						
Metal Pan Stairs						
Provide welder qualification report for each welder on site					Welder Qualifications	☑
55213						
Pipe and Tube Railings						
Provide welder qualification report for each welder on site					Welder Qualifications	☑
64023						
Interior Architectural Woodwork						
Hold Preinstallation meetings as specified					Meeting Minutes	☑
Perform Field Quality Control section of specifications					Test Report	☑
71326						
Self-Adhering Sheet Waterproofing						
Perform Field Quality Control section of specifications					test report	☑

Commissioning Items by CSI Division	Verified by: Name	Firm	Date compl	Coord Initial	Documentation Required	Owner Witness Required
71413						
Hot Applied Rebberized Asphalt Waterproofing						
Hold Preconstruction meetings as specified					Meeting Minutes	☑
Perform Field Quality Control section of specifications					test report	☑
71900						
Water Repellents						
Hold Preinstallation meetings as specified					Meeting Minutes	☑
74213						
Metal Wall Panels						
Build Mockup as specified					Inspection Report	☑
75423						
Thermoplastic-Polyolefin (TPO) Roofing						
Hold Preinstallation meetings as specified					Meeting Minutes	☑
Perform Field Quality Control section of specifications					Test Report	☑
76200						
Sheet Metal Flashing and Trim						
Conduct a preinstallation conference at project site per specifications					Meeting Minutes	☑

Commissioning Items by CSI Division	Verified by: Name	Firm	Date compl	Coord Initial	Documentation Required	Owner Witness Required
78413						
Penetration Firestopping						
Perform Field Quality Control section of specifications					Test Report	☑
79100						
Preformed Joint Sealants						
Hold preinstallation meetings as specified					Meeting Minutes	☑
79200						
Joint Sealants						
Hold preinstallation meetings as specified					Meeting Minutes	☑
Perform Field Quality Control section of specifications					Test Report	☑
81113						
Hollow Metal Doors and Frames						
Hold preinstallation meetings as specified					Meeting Minutes	☑
Perform Field Quality Control section of specifications					Test Report	☑
102113						
Toilet Compartments						
Build Mockups as specified					Inspection Report	☑

Commissioning Items by CSI Division	Verified by: Name	Firm	Date compl	Coord Initial	Documentation Required	Owner Witness Required
Conduct pre-installation testing per specifications					Meeting Minutes	☑
Perform Field Quality Control section of specifications					Test Report	☑
105113						
Metal Lockers						
Conduct pre-installation testing per specifications					Meeting Minutes	☑
Furnish Extra Material as specified					Transmittal	☑
122113						
Horizontal Louver Blinds						
Build Mockups as specified					Inspection Report	☑
Perform Demonstration section of specifications					Sign-In Sheet	☑
Provide Extra Stock as specified					Transmittal	☑
133419						
Metal Building Systems						
Conduct pre-installation testing per specifications					Meeting Minutes	☑
Perform Field Quality Control section of specifications					Test Report	☑

Commissioning Items by CSI Division	Verified by: Name	Firm	Date compl	Coord Initial	Documentation Required	Owner Witness Required
211313						
Wet-Pipe Sprinkler Systems						
Hold Preinstallation Meetings as specified					Meeting Minutes	☐
Perform Field Quality Control section of specifications					Test Report	☑
Provide Extra Stock as specified					Transmittal	☑
220500						
Common Work Results for Plumbing						
Hold MEP pre-installation meeting(s).					Meeting Minutes and Sign-up Sheet	☑
220523						
General-Duty Valves for Plumbing Piping						
Hold pre-installation meeting(s) as specifed					Meeting Minutes	☑
Provide Extra Materials as specified					Transmittal	☑
220553						
Identification for Plumbing Piping and Equipment						
Install valve tags on valves and control devices per specifications					Valve Schedule framed/posted	☐

Commissioning Items by CSI Division	Verified by: Name	Firm	Date compl	Coord Initial	Documentation Required	Owner Witness Required
220593						
Testing, Adjusting, and Balancing for Plumbing						
Confirm approved shop drawings, as-builts, O&Ms and change orders have been submitted to the TAB engineer prior to testing and balancing						☐
Coordinate and cooperate with owner's commissioning efforts						☐
Ensure pre-test requirements as specified in paragraph 1.01 have been completed						☐
Hold Pre-Balancing Conference as specified					Meeting Minutes	☑
Notify Owner's Representative 14 days prior to the scheduled date for balancing the system.					written notification	☐
Perform per specifications this section						☐
Supply control diagram					control diagram	☐
220719						
Plumbing Piping Insulation						
Perform Field Quality Control section of specification					Test Report	☑
221116						
Domestic Water Piping						
Fill and flush each system						☑

Commissioning Items by CSI Division	Verified by: Name	Firm	Date compl	Coord Initial	Documentation Required	Owner Witness Required
Obtain domestic water bacteria test and certification.					test report	☐
Perform Field Quality Control section of specifications					Test Report	☑
221119						
Domestic Water Piping Specialties						
Perform Field Quality Control section of specifications					Test Report	☑
221316						
Sanitary Waste and Vent Piping						
Test per Field Quality Control section of specifications.					Test Reports	☑
223300						
Electric, Domestic-Water Heaters						
Perform Demonstration section of specifications					Sign-In Sheet	☑
Perform Field Quality Control section of specifications					Test Report	☑
Pull Pressure Vessel Permit- if required.					Permit	☑
224100						
Plumbing Fixtures						
Provide Extra Materials as specified					Transmittal	☑

Commissioning Items by CSI Division	Verified by: Name	Firm	Date compl	Coord Initial	Documentation Required	Owner Witness Required
230500						
Common Work Results for HVAC						
Hold MEP pre-installation meeting(s).					Meeting Minutes	☑
230553						
Identification for HVAC Piping and Equipment						
Install pipe markers per specifications						☐
230594						
Testing, Adjusting, and Balancing						
Hold Pre-Balancing Conference as specified					Meeting Minutes	☑
Provide craftsmen of the proper trades to make adjustments/changes during TAB						☐
Provide Owner with manufacturers outlet factors and recommended procedures for testing						☐
Take Readings and produce final report					Balance Report	☑
230700						
HVAC Insulation						
Hold Pre-Installation Conference as specified					Meeting Minutes	☑
Perform Field Quality Control section of specifications					Test Report	☑

Commissioning Items by CSI Division	Verified by: Name	Firm	Date compl	Coord Initial	Documentation Required	Owner Witness Required
Verify required mechanical fasteners are installed per specifications.						☐
Verify that duct systems are tested prior to insulating						☐
230713						
Duct Insulation						
Build Mockups as specified					Inspection Report	☑
Perform Field Quality Control section of specifications					Test Report	☑
230900						
Control Systems						
Ensure Control Transformer amps are within specifications					Test Report	☑
Ensure shipping material has been removed from thermostats and other control devices						☐
Post laminated control diagram in mechanical room						☐
Verify all field devices provided by contractor are terminated						☐
Verify all panel covers are installed						☐

Commissioning Items by CSI Division	Verified by: Name	Firm	Date compl	Coord Initial	Documentation Required	Owner Witness Required
232300						
Refrigerant Piping						
Charge system per specifications						☐
Leak test per specifications					Test Report	☑
233113						
Metal Ducts						
test for duct leakage per spec. To a leakage class of 4, at least. Ducts shall meet leakage requirement prior to testing and balancing					test report	☑
233300						
Air Duct Accessories						
Demonstrate Proper Operation of All Fire Dampers per NFPA-90A.					test report	☑
Perform Field Quality Control section of specifications					Test Report	☑
233416						
Centrifugal HVAC Fans						
Perform Demonstration section of specifications					Sign-in sheet	☑
Perform Field Quality Control section of specifications					Test Report	☑
Perform Startup Service section of specification					Startup Report	☑

Commissioning Items by CSI Division	Verified by: Name	Firm	Date compl	Coord Initial	Documentation Required	Owner Witness Required
Verify fan rotation						☐
237313						
Indoor, Basic Air-Handling Units						
Perform Field Quality Control section of specifications					Test Report	☑
Perform System Startup section of specifications					start-up report	☑
Provide Extra Stock as specified					Transmittal	☑
Train end users and maintenance personnel per manufacturers requirements					Sign-In Sheet	☑
238126						
Split-System Air-Conditioners						
Perform Field Quality Control section of specifications					Test Report	☑
Provide Extra Stock as specified					Transmittal	☑
Provide factory training					Sign In Sheet	☑
260500						
Common work Results for Electrical						
Verify that every penetration through fire walls (re: life safety plans) has been properly firestopped					certification	☐

Commissioning Items by CSI Division	Verified by: Name	Firm	Date compl	Coord Initial	Documentation Required	Owner Witness Required
260513						
Medium-Voltage Cables						
Ensure wires are color coded per specifications						☐
Perform Field Quality Control section of specifications					Test Report	☑
260519						
Low-Voltage Electrical Power Conductors and Cables						
Perform independent tests per Field Quality Control section of spec, including megohm/high pot tests					test report	☑
260523						
Control-Voltage Electrical Power Cables						
Perform Field Quality Control section of specifications					test reports	☑
260526						
Grounding and Bonding for Electrical Systems						
Perform resistance test as described in "Field Quality Control" section of spec					test report	☑
260536						
Cable Trays for Electrical Systems						
Perform Field Quality Control section of specifications					test reports	☑

Commissioning Items by CSI Division	Verified by: Name	Firm	Date compl	Coord Initial	Documentation Required	Owner Witness Required
260543						
Underground Ducts and Raceways for Electrical Systems						
Hold Preinstallation Meetings as specified					Meeting Minutes	☑
Perform Field Quality Control section of specifications					Test Report	☑
Provide spare parts as specified					Transmittal	☑
260573						
Arc-Flash Hazard Analysis						
Perform 'Testing' section of specifications					Test Report	☑
Place arcflash labels on equipment as specified						☑
Provide SKM data to owners representative					Transmittal	☑
Coordination Study						
Factory certified technician to set electronic overcurrent devices to approved coordination study setpoints					Inspection Report	☑
Short-Circuit Studies						
Factory certified technician to set electronic overcurrent devices to approved coordination study setpoints					Inspection Report	☐
Train owners representatives in setting of overcurrent devices					Sign-up Sheet	☑

Commissioning Items by CSI Division	Verified by: Name	Firm	Date compl	Coord Initial	Documentation Required	Owner Witness Required
260916						
Electrical Controls and Relay Panels						
Perform Demonstration section of spec					Sign-In Sheet	☑
260923						
Lighting Control Devices						
Factory rep shall provide start-up per field quality control section of spec					field report	☐
Perform Training per Spec					Sign In Sheet	☑
261219						
Pad-Mounted, Liquid-Filled, Medium Voltage Transformers						
Perform checks as described in "Field Quality Control" section of spec					Test Report	☑
261326						
Medium-Voltage MetalClad Switchgear						
Factory rep shall provide pretesting and adjustment per "Field Quality Control" section of spec					field report, test report	☑
Perform Testing at the Jobsite section of specifications					Test Report	☑
262726						
Wiring Devices						
Operate All Devices per "Field Quality Control" section of spec to verify correct operation						☐

Commissioning Items by CSI Division	Verified by: Name	Firm	Date compl	Coord Initial	Documentation Required	Owner Witness Required
263250						
Package Electrical Building						
Field Installation by Manufacturer's Representative					Startup Report	☑
Perform Demonstration section of specifications					Sign-in Sheet	☑
Provide Extra Materials as specified					Transmittal	☑
263343						
Battery Chargers						
Perform all tests as noted in "Field Quality Control" section of spec					Test Report	☑
Perform Demonstration section of specifications					Sign-in Sheet	☑
263533						
Medium-Voltage Power Factor Correction Equipment						
Perform all tests as noted in "Field Quality Control" section of spec					Test Report	☑
263600						
Transfer Switches						
Operate All Devices per "Field Quality Control" section of spec to verify correct operation					Test Report	☑
Train Personnel per Personnel Training" section of spec					Sign-up Sheet	☑

Commissioning Items by CSI Division	Verified by: Name	Firm	Date compl	Coord Initial	Documentation Required	Owner Witness Required
264113						
Lightning Protection for Structures						
Perform Field Quality Control section of specifications					Test Report	☑
Provide periodic and final inspections as required by LPI-177 in order to obtain UL Master Label					field report, certification, and Master Label	☑
265000						
Lighting						
Perform Field Quality Control section of specifications					Test Report	☑
Perform System Startup section of specification					Startup Report	☑
Test Emergency Lighting fixtures for proper operation					Test Report	☑
312000						
Earth Moving						
Help with site compaction tests per contract documents					test report by 3rd party	☑
316329						
Drilled Concrete Piers and Shafts						
Help with Field Quality Control per contract documents					Test Report by 3rd party	☑
Hold PreInstallation meetings as specified					Meeting Minutes	☑

Commissioning Items by CSI Division	Verified by: Name	Firm	Date compl	Coord Initial	Documentation Required	Owner Witness Required
321216						
Asphalt Paving						
Help with Field Quality Control per contract documents					Test Report by 3rd party	☑
321313						
Concrete Paving						
Provide protection and curing per specifications						☐
Concrete Paving						
Help with Field Quality Control per contract documents					Test Report by 3rd party	☑
Notify Owner's Representative 24 hours prior to placement of concrete.						☑
323113						
Chain Link Fences and Gates						
Help with Field Quality Control per contract documents					Test Report by 3rd party	☑
Hold PreInstallation meetings as specified					Meeting Minutes	☑
331000						
Water Utility Distribution						
Perform Fire Hydrant testing and commissioning per spec.					Test Report	☑

Commissioning Items by CSI Division	Verified by: Name	Firm	Date compl	Coord Initial	Documentation Required	Owner Witness Required
333100						
Sanitary Utility Sewerage Piping						
Perform Field Quality Control section of specifications					Test Report	☑
334600						
Subdrainage						
Perform Field Quality Control section of specifications					Test Report	☑
334613						
Foundation Drainage						
Perform Field Quality Control section of specifications					Test Report	☑
337100						
Main Electric Supply Station						
Furnish Extra Material as specified					Transmittal	☑
Perform Field Quality Control section of specifications					Test Report	☑
337126						
Current Limiting Air Core Reactor						
Perform Testing Section of specifications					Test Report	☑
337520						
72.5kV SF6 Ciruit Breakers						
Furnish Extra Material as specified					Transmittal	☑

Commissioning Items by CSI Division	Verified by: Name	Firm	Date compl	Coord Initial	Documentation Required	Owner Witness Required
Perform Field Quality Control section of specifications					Test Report	☑

Please see following website for suggested commissioning forms:

https://operations.missouri.edu/facilities/commissioning-forms

Construction Management Checklist for Energizing Utilities

(Contractor to initial each item upon completion and provide completed form to the Owner's Representative prior to energizing utility)

AM #1

Water – turned on to the first valve past Energy Management's last valve.

___ Review all piping and equipment being turned on for proper installation and completed testing.
___ Insulation installed (preferred but not required)
___ Meter properly installed, working, and in readable location.
___ Contractor has swabbed out with chlorine all piping from the backflow preventer to the source while installing.
___ All bacteriological tests have been completed and passed.
___ Backflow preventer installed and tested. (will need water pressure to test)
___ Pressure test completed in piping being turned on.
___ Contractor has method to communicate "Services On" to other contractor personnel and Owner's personnel.
___ Consultant has signed off

Steam – turned on to the first valve past Energy Management's last valve.

___ Review all piping, equipment, valves, reducing stations, relief valves, etc. for proper installation and complete testing.
___ Piping protected from the weather.
___ Insulation must be installed.
___ All hangers and bolts have been installed.
___ Meter installed, working and in readable location. (Don't need metasys to turn on.)
___ All needed traps are installed and able to be tested as they are turned on.
___ Condensate system is installed and operating including the pumping system.
___ Pressure test completed in piping being turned on.
___ Contractor has method to communicate "Services On" to other contractor personnel and Owner's personnel.
___ Consultant has signed off

Condensate – turned on to the first valve past Energy Management's last valve.

___ Review all piping and equipment being turned on for proper installation and completed testing.
___ Piping protected from the weather.
___ Insulation installed (preferred but not required)
___ Pressure test completed in piping being turned on.
___ Contractor has method to communicate "Services On" to other contractor personnel and Owner's personnel.
___ Consultant has signed off

Electric – turned on to the first breaker past 13.8kV transformer.

___ Review all wiring and equipment being turned on for proper installation and completed testing
___ GFCI set and tested.
___ Breakers set and tested.
___ All needed permanent grounds are installed.
___ Meter installed, working and in readable location.
___ Main switchgear protected from the weather.
___ Contractor has method to communicate "Services On" to other contractor personnel and Owner's personnel.
___ Consultant has signed off

Chilled Water – turned on to the first valve inside of building.

___ Review all piping and equipment being turned on for proper installation and completed testing.
___ Pressure test completed in piping being turned on.
___ Insulation must be installed.
___ Meter installed, working and connected to Metasys.
___ Building pump and automatic isolation/control valve must be installed and under control.
___ If chillers are installed, automatic loop pump isolation must be installed.
___ Control valves must be installed and automatically controlled on all loads.
___ Contractor has method to communicate "Services On" to other contractor personnel and Owner's personnel.
___ Consultant has signed off

SECTION 034100 - PRECAST STRUCTURAL CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Precast structural concrete.
2. Precast structural concrete with commercial architectural finish.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for placing connection anchors in concrete.
2. Section 051200 "Structural Steel Framing" for furnishing and installing connections attached to structural-steel framing.
3. Section 055000 "Metal Fabrications" for kickers and other miscellaneous steel shapes.
4. Section 071900 "Water Repellents" for water-repellent finish treatments.

1.3 DEFINITIONS

A. Design Reference Sample: Sample of approved precast structural concrete color, finish, and texture, preapproved by Architect.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Design Mixtures: For each precast concrete mixture. Include compressive strength and, if required, water-absorption tests.

C. Shop Drawings:

1. Include member locations, plans, elevations, dimensions, shapes and sections, openings, support conditions, and types of reinforcement, including special reinforcement.
2. Detail fabrication and installation of precast structural concrete units, including connections at member ends and to adjoining construction.
3. Indicate joints, reveals, drips, chamfers, and extent and location of each surface finish.
4. Indicate type, size, and length of welded connections by AWS standard symbols.
5. Detail loose and cast-in hardware, lifting and erection inserts, connections, and joints.
6. Indicate locations, tolerances, and details of anchorage devices to be embedded in or attached to structure or other construction.
7. Include and locate openings larger than 10 inches. Where additional structural support is required, include header design.
8. Indicate location of each precast structural concrete unit by same identification mark placed on panel.
9. Indicate relationship of precast structural concrete units to adjacent materials.
10. Indicate shim sizes and grouting sequence.
11. If design modifications are proposed to meet performance requirements and field conditions, submit design calculations and Shop Drawings. Do not adversely affect the appearance, durability, or strength of units when modifying details or materials and maintain the general design concept.

D. Samples:

1. For each type of finish indicated on exposed surfaces of precast structural concrete units with architectural finish, in sets of three, representative of finish, color, and texture variations expected; approximately 12 by 12 by 2 inches.

    a. Where other faces of precast concrete unit are exposed, include Samples illustrating workmanship, color, and texture of backup concrete as well as facing concrete.

E. Delegated-Design Submittal: For precast structural concrete indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Show precast structural concrete unit types, connections, types of reinforcement, including special reinforcement, and concrete cover on reinforcement. Indicate location, type, magnitude, and direction of loads imposed on the building structural frame from precast structural concrete.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer, fabricator and testing agency.

B. Welding certificates.

C. Material Certificates: For the following:

1. Cementitious materials.
2. Reinforcing materials and prestressing tendons.

3. Admixtures.
4. Insulation.
5. Structural-steel shapes and hollow structural sections.

D. Material Test Reports: For aggregates, by a qualified testing agency.

E. Preconstruction test reports.

F. Source quality-control reports.

G. Field quality-control and special inspection reports.

1.7 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm that assumes responsibility for engineering precast structural concrete units to comply with performance requirements. Responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

1. Designated as a PCI-certified plant as follows:

a. Group C, Category C1 - Precast Concrete Products (no prestressed reinforcement).

B. Installer Qualifications: A precast concrete erector qualified and designated by PCI's Certificate of Compliance, to erect Category S1 - Simple Structural Systems.

C. Testing Agency Qualifications: Qualified according to ASTM C1077 and ASTM E329 for testing indicated.

D. Quality-Control Standard: For manufacturing procedures, testing requirements, and quality-control recommendations for types of units required, comply with PCI MNL 116, "Manual for Quality Control for Plants and Production of Structural Precast Concrete Products."

E. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code - Steel."
2. AWS D1.4, "Structural Welding Code - Reinforcing Steel."

F. Sample Panels: After submittal sample approval and before fabricating precast structural concrete units with architectural finish, produce a minimum of two sample panels approximately 16 sq. ft. in area for review by Architect. Incorporate full-scale details of architectural features (reveals, panel edges and corners, openings), finishes, textures, and transitions in sample panels.

1. Locate panels on-site as directed by Architect.
2. Damage part of an exposed-face surface for each finish, color, and texture, and demonstrate adequacy of repair techniques proposed for repair of surface blemishes.
3. After approval of repair technique, maintain one sample panel at fabricator's plant and one at Project site in an undisturbed condition as a standard for judging the completed Work.
4. Demolish and remove sample panels when directed.

G. Mockups: After sample panel approval but before production of any precast structural concrete units with architectural finish, construct two full-sized mockups of adjacent screenwall panels to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. Coordinate location and selected panel pair of mock-ups with Owner and Architect. Build mockup as indicated on Drawings including sealants and precast structural concrete units with an architectural finish complete with anchors, connections, flashings, and joint fillers.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 COORDINATION

A. Furnish loose connection hardware and anchorage items to be embedded in or attached to other construction before starting that Work. Provide locations, setting diagrams, templates, instructions, and directions, as required, for installation.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Support units during shipment on non-staining shock-absorbing material in same position as during storage.

B. Store units with adequate bracing and protect units to prevent contact with soil, to prevent staining, and to prevent cracking, distortion, warping or other physical damage.

1. Store units with dunnage across full width of each bearing point unless otherwise indicated.
2. Place adequate dunnage of even thickness between each unit.
3. Place stored units so identification marks are clearly visible, and units can be inspected.

C. Handle and transport units in a manner that avoids excessive stresses that cause cracking or damage.

D. Lift and support units only at designated points indicated on Shop Drawings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design precast structural concrete units.

B. Design Standards: Comply with ACI 318 and with design recommendations in PCI MNL 120, "PCI Design Handbook - Precast and Prestressed Concrete," applicable to types of precast structural concrete units indicated.

C. Fire-Resistance Calculations: Where indicated, provide precast structural concrete units whose fire resistance meets prescriptive requirements of authorities having jurisdiction or has been calculated according to ACI 216.1 and PCI MNL 124, "Design for Fire Resistance of Precast Prestressed Concrete," and is acceptable to authorities having jurisdiction.

D. Structural Performance: Precast structural concrete units and connections shall withstand design loads indicated within limits and under conditions indicated.

E. Structural Performance: Provide precast structural concrete units and connections capable of withstanding the design loads as indicated on the drawings.

2.2 MOLD MATERIALS

A. Molds: Rigid, dimensionally stable, non-absorptive material, warp and buckle free, that provides continuous precast concrete surfaces within fabrication tolerances indicated; nonreactive with concrete and suitable for producing required finishes.

1. Mold-Release Agent: Commercially produced form-release agent that does not bond with, stain, or adversely affect precast concrete surfaces and does not impair subsequent surface or joint treatments of precast concrete.

B. Form Liners: Units of face design, texture, arrangement, and configuration to match those used for precast concrete design reference sample. Furnish with manufacturer's recommended form-release agent that does not bond with, stain, or adversely affect precast concrete surfaces and does not impair subsequent surface or joint treatments of precast concrete.

C. Surface Retarder: Chemical set retarder, capable of temporarily delaying setting of newly placed concrete mixture to depth of reveal specified.

2.3 REINFORCING MATERIALS

A. Reinforcing Bars: ASTM A615, Grade 60, deformed.

B. Steel Bar Mats: ASTM A184, fabricated from ASTM A615, Grade 60, deformed bars, assembled with clips.

C. Plain-Steel Welded Wire Reinforcement: ASTM A185, fabricated from as-drawn steel or galvanized-steel wire into flat sheets.

D. Deformed-Steel Welded Wire Reinforcement: ASTM A497 or ASTM A1064, flat sheet.

E. Supports: Suspend reinforcement from back of mold or use bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place according to PCI MNL 116.

2.4 PRESTRESSING TENDONS

A. Pretensioning Strand: ASTM A416, Grade 250 or Grade 270, uncoated, seven-wire or ASTM A886, Grade 270, indented, seven-wire, low-relaxation strand.

B. Unbonded Post-Tensioning Strand: ASTM A416, Grade 270, uncoated, seven-wire, low-relaxation strand.

1. Coat unbonded post-tensioning strand with post-tensioning coating complying with ACI 423.7 and sheath with polypropylene tendon sheathing complying with ACI 423.7. Include anchorage devices and coupler assemblies.

C. Post-Tensioning Bars: ASTM A722, uncoated high-strength steel bar.

2.5 CONCRETE MATERIALS

A. Portland Cement: ASTM C150, Type I or Type III, gray, unless otherwise indicated.

1. For surfaces exposed to view in finished structure, use gray or white cement, of same type, brand, and mill source.

B. Supplementary Cementitious Materials:

1. Fly Ash: ASTM C618, Class C or F, with maximum loss on ignition of 3 percent.
2. Metakaolin: ASTM C618, Class N.
3. Silica Fume: ASTM C1240, with optional chemical and physical requirement.
4. Ground Granulated Blast-Furnace Slag: ASTM C989, Grade 100 or 120.

C. Normal-Weight Aggregates: Except as modified by PCI MNL 116, ASTM C33 with coarse aggregates complying with Class 5S. Stockpile fine and coarse aggregates for each type of exposed finish from a single source (pit or quarry) for Project.

1. Face-Mixture-Coarse Aggregates: Selected, hard, and durable; free of material that reacts with cement or causes staining; to match selected finish sample.

a. Gradation: Uniformly graded.

2. Face-Mixture-Fine Aggregates: Selected, natural or manufactured sand compatible with coarse aggregate to match approved finish sample.

D. Coloring Admixture: ASTM C979, synthetic or natural mineral-oxide pigments or colored water-reducing admixtures, temperature stable, and nonfading.

E. Water: Potable; free from deleterious material that may affect color stability, setting, or strength of concrete and complying with chemical limits of PCI MNL 116.

F. Air-Entraining Admixture: ASTM C260, certified by manufacturer to be compatible with other required admixtures.

G. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and to not contain calcium chloride, or more than 0.15 percent chloride ions or other salts by weight of admixture.

1. Water-Reducing Admixtures: ASTM C494, Type A.
2. Retarding Admixture: ASTM C494, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C494, Type D.
4. Water-Reducing and Accelerating Admixture: ASTM C494, Type E.
5. High-Range, Water-Reducing Admixture: ASTM C494, Type F.
6. High-Range, Water-Reducing and Retarding Admixture: ASTM C494, Type G.
7. Plasticizing Admixture: ASTM C1017M, Type I.
8. Plasticizing and Retarding Admixture: ASTM C1017, Type II.
9. Corrosion-Inhibiting Admixture: ASTM C1582.

2.6 STEEL CONNECTION MATERIALS

A. Carbon-Steel Shapes and Plates: ASTM A36.

B. Carbon-Steel-Headed Studs: ASTM A108, Grade 1010 through 1020, cold finished, AWS D1.1, Type A or B, with arc shields and with minimum mechanical properties of PCI MNL 116.

C. Carbon-Steel Plate: ASTM A283, Grade C.

D. Malleable-Iron Castings: ASTM A47, Grade 32510 or Grade 35028.

E. Carbon-Steel Castings: ASTM A27, Grade 60-30.

F. High-Strength, Low-Alloy Structural Steel: ASTM A572.

G. Carbon-Steel Structural Tubing: ASTM A500, Grade B or Grade C.

H. Wrought Carbon-Steel Bars: ASTM A675, Grade 65.

I. Deformed-Steel Wire or Bar Anchors: ASTM A496 or ASTM A706.

J. Carbon-Steel Bolts and Studs: ASTM A307, Grade A; carbon-steel, hex-head bolts and studs; carbon-steel nuts, ASTM A563; and flat, unhardened steel washers, ASTM F844.

K. High-Strength Bolts, Nuts, and Washers: ASTM F3125,Grade A325 Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436, Type 1, hardened carbon-steel washers.

1. Finish: Hot-dip zinc coating.

L. High-Strength Bolts, Nuts, and Washers: ASTM F3125, Grade A490, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436, Type 1, hardened carbon-steel washers; all with plain finish.

M. Zinc-Coated Finish: For exterior steel items, steel in exterior walls, and items indicated for galvanizing, apply zinc coating by hot-dip process according to ASTM A123 or ASTM A153.

1. For steel shapes, plates, and tubing to be galvanized, limit silicon content of steel to less than 0.03 percent or to between 0.15 and 0.25 percent or limit sum of silicon and 2.5 times phosphorous content to 0.09 percent.
2. Galvanizing Repair Paint: High-zinc-dust-content paint with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035B or SSPC-Paint 20.

N. Shop-Primed Finish: Prepare surfaces of nongalvanized-steel items, except those surfaces to be embedded in concrete, according to requirements in SSPC-SP 3, and shop apply lead- and chromate-free, rust-inhibitive primer, complying with performance requirements in MPI 79 according to SSPC-PA 1.

O. Welding Electrodes: Comply with AWS standards.

P. Precast Accessories: Provide clips, hangers, plastic or steel shims, and other accessories required to install precast structural concrete units.

2.7 ACCESSORIES

A. Reglets: Specified in Section 076200 "Sheet Metal Flashing and Trim."

B. Reglets: Stainless steel, Type 302 or Type 304 felt or fiber filled, or with face opening of slots covered.

C. Precast Accessories: Provide clips, hangers, high-density plastic or steel shims, and other accessories required to install structural precast concrete units.

2.8 GROUT MATERIALS

A. Sand-Cement Grout: Portland cement, ASTM C150 Type I, and clean, natural sand, ASTM C144 or ASTM C404. Mix at ratio of 1 part cement to 2-1/2 to 3 parts sand, by volume, with minimum water required for placement and hydration. Water-soluble chloride ion content less than 0.06 percent by weight of cement when tested according to ASTM C1218.

B. Nonmetallic, Nonshrink Grout: Packaged, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C1107, Grade A for drypack and Grades B and C for flowable grout and of consistency suitable for application within a 30-minute working

time. Water-soluble chloride ion content less than 0.06 percent by weight of cement when tested according to ASTM C1218.

C. Epoxy-Resin Grout: Two-component, mineral-filled epoxy resin; ASTM C881, of type, grade, and class to suit requirements.

2.9 INSULATED FLAT-WALL PANEL ACCESSORIES

A. Wythe Connectors: Glass-fiber-reinforced vinylester connectors, Polypropylene pin connectors, Stainless steel pin connectors, Bent galvanized reinforcing bars, Galvanized welded wire trusses, Galvanized bent wire connectors, Epoxy-coated carbon-fiber grid, or Fiberglass trusses manufactured to connect wythes of precast concrete panels.

B. Extruded-Polystyrene Board Insulation: ASTM C578, Type IV, 1.55 lb/cu. Ft; square edges; with thickness of 4”.

2.10 CONCRETE MIXTURES

A. Prepare design mixtures for each type of precast concrete required.

1. Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.
2. Limit use of fly ash to 20 percent replacement of portland cement by weight and ground granulated blast-furnace slag to 20 percent of portland cement by weight; metakaolin and silica fume to 10 percent of portland cement by weight.

B. Design mixtures may be prepared by a qualified independent testing agency or by qualified precast plant personnel at precast structural concrete fabricator's option.

C. Limit water-soluble chloride ions to maximum percentage by weight of cement permitted by ACI 318 or PCI MNL 116 when tested according to ASTM C1218.

D. Normal-Weight Concrete Mixtures: Proportion face and backup mixtures or full-depth mixtures, at fabricator's option by either laboratory trial batch or field test data methods according to ACI 211.1, with materials to be used on Project, to provide normal-weight concrete with the following properties:

1. Compressive Strength (28 Days): 5000 psi minimum.
2. Maximum Water-Cementitious Materials Ratio: 0.45.

E. Water Absorption: For structural precast concrete with an architectural finish, limit water absorption to 6 percent by weight or 14 percent by volume, tested according to ASTM C642, except for boiling requirement.

F. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content complying with PCI MNL 116.

G. When included in design mixtures, add other admixtures to concrete mixtures according to manufacturer's written instructions.

H. Concrete Mix Adjustments: Concrete mix design adjustments may be proposed if characteristics of materials, Project conditions, weather, test results, or other circumstances warrant.

2.11 MOLD FABRICATION

A. Molds: Accurately construct molds, mortar tight, of sufficient strength to withstand pressures due to concrete-placement operations and temperature changes and for prestressing and detensioning operations. Coat contact surfaces of molds with release agent before reinforcement is placed. Avoid contamination of reinforcement and prestressing tendons by release agent.

1. Place form liners accurately to provide finished surface texture indicated. Provide solid backing and supports to maintain stability of liners during concrete placement. Coat form liner with form-release agent.

B. Maintain molds to provide completed precast structural concrete units of shapes, lines, and dimensions indicated, within fabrication tolerances specified.

1. Form joints are not permitted on faces of structural precast concrete with an architectural finish that is exposed to view in the finished work.
2. Edge and Corner Treatment: Uniformly chamfered.

2.12 FABRICATION

A. Cast-in Anchors, Inserts, Plates, Angles, and Other Anchorage Hardware: Fabricate anchorage hardware with sufficient anchorage and embedment to comply with design requirements. Accurately position for attachment of loose hardware, and secure in place during precasting operations. Locate anchorage hardware where it does not affect position of main reinforcement or concrete placement.

1. Weld-headed studs and deformed bar anchors used for anchorage according to AWS D1.1/D1.1M and AWS C5.4, "Recommended Practices for Stud Welding."

B. Furnish loose hardware items including steel plates, clip angles, seat angles, anchors, dowels, cramps, hangers, and other hardware shapes for securing precast structural concrete units to supporting and adjacent construction.

C. Cast-in reglets, slots, holes, and other accessories in precast structural concrete units as indicated on the Contract Drawings.

D. Cast-in openings larger than 10 inches in any dimension. Do not drill or cut openings or prestressing strand without Architect's approval.

E. Reinforcement: Comply with recommendations in PCI MNL 116 for fabricating, placing, and supporting reinforcement.

1. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy the bond with concrete. When damage to epoxy-coated reinforcement exceeds limits specified in ASTM A775/A775M, repair with patching material compatible with coating material and epoxy coat bar ends after cutting.
2. Accurately position, support, and secure reinforcement against displacement during concrete-placement and consolidation operations. Completely conceal support devices to prevent exposure on finished surfaces.
3. Place reinforcing steel and prestressing strand to maintain at least 3/4-inch minimum concrete cover. Increase cover requirements for reinforcing steel to 1-1/2 inches when units are exposed to corrosive environment or severe exposure conditions. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete. Direct wire tie ends away from finished, exposed concrete surfaces.
4. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh spacing and wire tie laps, where required by design. Offset laps of adjoining widths to prevent continuous laps in either direction.

F. Reinforce precast structural concrete units to resist handling, transportation, and erection stresses and specified in-place loads.

G. Prestress tendons for precast structural concrete units by either pretensioning or post-tensioning methods. Comply with PCI MNL 116.

1. Delay detensioning or post-tensioning of precast, prestressed structural concrete units until concrete has reached its indicated minimum design release compressive strength as established by test cylinders cured under same conditions as concrete unit.
2. Detension pretensioned tendons either by gradually releasing tensioning jacks or by heat cutting tendons, using a sequence and pattern to prevent shock or unbalanced loading.
3. If concrete has been heat cured, detension while concrete is still warm and moist to avoid dimensional changes that may cause cracking or undesirable stresses.
4. Protect strand ends and anchorages with bituminous, zinc-rich, or epoxy paint to avoid corrosion and possible rust spots.
5. Protect strand ends and anchorages with a minimum of 1-inch-thick, nonmetallic, nonshrink, grout mortar and sack rub surface. Coat or spray the inside surfaces of pocket with bonding agent before installing grout.

H. Comply with requirements in PCI MNL 116 and in this Section for measuring, mixing, transporting, and placing concrete. After concrete batching, no additional water may be added.

I. Place face mixture to a minimum thickness after consolidation of the greater of 1 inch or 1.5 times the maximum aggregate size, but not less than the minimum reinforcing cover specified.

J. Place concrete in a continuous operation to prevent cold joints or planes of weakness from forming in precast concrete units.

1. Place backup concrete mixture to ensure bond with face-mixture concrete.

K. Thoroughly consolidate placed concrete by vibration without dislocating or damaging reinforcement and built-in items, and minimize pour lines, honeycombing, or entrapped air voids on surfaces. Use equipment and procedures complying with PCI MNL 116.

1. Place self-consolidating concrete without vibration according to PCI TR-6, "Interim Guidelines for the Use of Self-Consolidating Concrete in Precast/Prestressed Concrete Institute Member Plants." Ensure adequate bond between face and backup concrete, if used.

L. Comply with PCI MNL 116 procedures for hot- and cold-weather concrete placement.

M. Identify pickup points of precast structural concrete units and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint or permanently mark casting date on each precast structural concrete unit on a surface that does not show in finished structure.

N. Cure concrete, according to requirements in PCI MNL 116, by moisture retention without heat or by accelerated heat curing using live steam or radiant heat and moisture. Cure units until compressive strength is high enough to ensure that stripping does not have an effect on performance or appearance of final product.

O. Discard and replace precast structural concrete units that do not comply with requirements, including structural, manufacturing tolerance, and appearance, unless repairs meet requirements in PCI MNL 116 and meet Architect's approval.

2.13 CASTING INSULATED WALL PANELS

A. Cast, screed, and consolidate wythe supported by mold.

B. Place insulation boards abutting edges and ends of adjacent boards. Insert wythe connectors through insulation, and consolidate concrete around connectors according to connector manufacturer's written instructions.

C. Ensure bottom wythe and insulation layer are not disturbed after bottom wythe reaches initial set.

D. Cast, screed, and consolidate top wythe to meet required finish.

E. Maintain temperature below 150 deg F in bottom concrete wythe.

2.14 FABRICATION TOLERANCES

A. Fabricate precast structural concrete units to shapes, lines, and dimensions indicated so each finished unit complies with PCI MNL 116 product dimension tolerances as well as position tolerances for cast-in items.

1. Variation in Cross-Sectional Dimensions: For thickness of walls from dimensions indicated: Plus or minus 1/4 inch.
2. Variation in Joint Width: 1/8 inch in 36 inches or a quarter of nominal joint width, whichever is less.

3. Variation in Plane between Adjacent Stone Units (Lipping): 1/16-inch difference between planes of adjacent units.

2.15 COMMERCIAL FINISHES

A. Commercial Grade (As-Cast) : Remove fins and protrusions larger than 1/8 inch and fill holes larger than 1/2 inch. Rub or grind ragged edges. Faces must have true, well-defined surfaces. Air holes, water marks, and color variations are permitted. Limit form joint offsets to 3/16 inch.

B. Screed or float finish unformed surfaces. Strike off and consolidate concrete with vibrating screeds to a uniform finish. Hand screed at projections. Normal color variations, minor indentations, minor chips, and spalls are permitted. Major imperfections, honeycombing, or defects are not permitted.

C. Smooth, steel trowel finish unformed surfaces. Consolidate concrete, bring to proper level with straightedge, float, and trowel to a smooth, uniform finish.

D. Apply roughened surface finish according to ACI 318 to precast concrete units that receive concrete topping after installation.

2.16 COMMERCIAL ARCHITECTURAL FINISHES

A. Manufacture member faces free of joint marks, grain, and other obvious defects with corners, including false joints, uniform and straight. Finish exposed-face surfaces of precast concrete units as follows:
   1. Honed Finish: Use continuous mechanical abrasion with fine grit, followed by filling and rubbing procedures. – Provide at all exterior (public facing) surfaces
   2. As-Cast Finish (commercial grade): Provide at all interior (equipment facing) surfaces
   3. At all honed finish surfaces provide bare concrete surfaces unless otherwised noted and provide added decorative concrete stain in locations as indicated on elevation drawings.

2.17 SOURCE QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to evaluate precast structural concrete fabricator's quality-control and testing methods.

   1. Allow testing agency access to material storage areas, concrete production equipment, concrete placement, and curing facilities. Cooperate with testing agency and provide samples of materials and concrete mixtures as may be requested for additional testing and evaluation.

B. Testing: Test and inspect precast structural concrete according to PCI MNL 116 requirements and ASTM C1610, ASTM C1611, ASTM C1621, and ASTM C1712.

   1. Test and inspect self-consolidating concrete according to PCI TR-6.

C. Strength of precast structural concrete units is considered deficient if units fail to comply with ACI 318 requirements for concrete strength.

D. If there is evidence that strength of precast concrete units may be deficient or may not comply with ACI 318 requirements, employ a qualified testing agency to obtain, prepare, and test cores drilled from hardened concrete to determine compressive strength according to ASTM C42.

1. A minimum of three representative cores shall be taken from units of suspect strength, from locations directed by Architect.
2. Test cores in an air-dry condition or, if units are wet under service conditions, test cores after immersion in water in a wet condition.
3. Strength of concrete for each series of three cores is considered satisfactory if average compressive strength is equal to at least 85 percent of 28-day design compressive strength and no single core is less than 75 percent of 28-day design compressive strength.
4. Report test results in writing on same day that tests are performed, with copies to Architect, Contractor, and precast concrete fabricator. Test reports include the following:

    a. Project identification name and number.
    b. Date when tests were performed.
    c. Name of precast concrete fabricator.
    d. Name of concrete testing agency.
    e. Identification letter, name, and type of precast concrete unit(s) represented by core tests; design compressive strength; type of break; compressive strength at breaks, corrected for length-diameter ratio; and direction of applied load to core in relation to horizontal plane of concrete as placed.

E. Patching: If core test results are satisfactory and precast structural concrete units comply with requirements, clean and dampen core holes and solidly fill with same precast concrete mixture that has no coarse aggregate, and finish to match adjacent precast concrete surfaces.

F. Defective Units: Discard and replace precast structural concrete units that do not comply with requirements, including strength, manufacturing tolerances, and color and texture range. Chipped, spalled, or cracked units may be repaired, subject to Architect's approval. Architect reserves the right to reject precast units that do not match approved samples, sample panels, and mockups. Replace unacceptable units with precast concrete units that comply with requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting structural frame or foundation and conditions for compliance with requirements for installation tolerances, bearing surface tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Do not install precast concrete units until supporting, cast-in-place concrete has attained minimum allowable design compressive strength and until supporting steel or other structure is structurally ready to receive loads from precast concrete units.

3.2 INSTALLATION

A. Install clips, hangers, bearing pads, and other accessories required for connecting precast structural concrete units to supporting members and backup materials.

B. Erect precast structural concrete level, plumb, and square within specified allowable tolerances. Provide temporary structural framing, shoring, and bracing as required to maintain position, stability, and alignment of units until permanent connections are complete.

1. Install temporary steel or plastic spacing shims or bearing pads as precast structural concrete units are being erected. Tack weld steel shims to each other to prevent shims from separating.
2. Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.
3. Remove projecting lifting devices and use plastic patch caps or sand-cement grout to fill voids within recessed lifting devices flush with surface of adjacent precast surfaces when recess is exposed.
4. For hollow-core slab voids used as electrical raceways or mechanical ducts, align voids between units and tape butt joint at end of slabs.

C. Connect precast structural concrete units in position by bolting, welding, grouting, or as otherwise indicated on Shop Drawings. Remove temporary shims, wedges, and spacers as soon as practical after connecting and grouting are completed.

1. Do not permit connections to disrupt continuity of roof flashing.

D. Field cutting of precast units is not permitted without approval of Architect.

E. Fasteners: Do not use drilled or powder-actuated fasteners for attaching accessory items to precast, prestressed concrete units.

F. Welding: Comply with applicable requirements in AWS D1.1/D1.1M and AWS D1.4/D1.4M for welding, welding electrodes, appearance, quality of welds, and methods used in correcting welding work.

1. Protect precast structural concrete units and bearing pads from damage by field welding or cutting operations, and provide noncombustible shields as required.
2. Clean weld-affected steel surfaces with chipping hammer followed by brushing, and apply a minimum 4.0-mil-thick coat of galvanized repair paint to galvanized surfaces according to ASTM A780.
3. Clean weld-affected steel surfaces with chipping hammer followed by brushing, and reprime damaged painted surfaces.
4. Visually inspect welds and remove, reweld, or repair incomplete and defective welds.

G. At bolted connections, use lock washers, tack welding, or other approved means to prevent loosening of nuts after final adjustment.

1. Where slotted connections are used, verify bolt position and tightness. For sliding connections, properly secure bolt but allow bolt to move within connection slot.
2. For slip-critical connections, use one of the following methods to assure proper bolt pretension:

a. Turn-of-Nut: According to RCSC's "Specification for Structural Joints Using ASTM A325 or A 490 Bolts."
b. Calibrated Wrench: According to RCSC's "Specification for Structural Joints Using ASTM A325 or A 490 Bolts."
c. Twist-off Tension Control Bolt: ASTM F3125, Grade 1852.
d. Direct-Tension Control Bolt: ASTM F3125, Grade 1852.

3. For slip-critical connections, use method and inspection procedure approved by Architect and coordinated with inspection agency.

H. Grouting or Dry-Packing Connections and Joints: Grout connections and joints and open spaces at keyways, connections, and joints where required or indicated on Shop Drawings. Retain flowable grout in place until hard enough to support itself. Alternatively, pack spaces with stiff dry-pack grout material, tamping until voids are completely filled.

1. Place grout and finish smooth, level, and plumb with adjacent concrete surfaces.
2. Fill joints completely without seepage to other surfaces.
3. Trowel top of grout joints on roofs smooth and uniform. Finish transitions between different surface levels not steeper than 1 to 12.
4. Place grout end cap or dam in voids at ends of hollow-core slabs.
5. Promptly remove grout material from exposed surfaces before it affects finishes or hardens.
6. Keep grouted joints damp for not less than 24 hours after initial set.

3.3 ERECTION TOLERANCES

A. Erect precast structural concrete units level, plumb, square, and in alignment without exceeding the noncumulative erection tolerances of PCI MNL 135.

B. Minimize variations between adjacent slab members by jacking, loading, or other method recommended by fabricator and approved by Architect.

3.4 FIELD QUALITY CONTROL

A. Special Inspections: Engage a qualified special inspector to perform the following special inspections:

1. Erection of precast structural concrete members.

B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

C. Visually inspect field welds and test according to ASTM E165 or to ASTM E709 and ASTM E1444. High-strength bolted connections are subject to inspections.

D. Testing agency will report test results promptly and in writing to Contractor and Architect.

E. Repair or remove and replace work where tests and inspections indicate that it does not comply with specified requirements.

F. Additional testing and inspecting, at Contractor's expense, shall be performed to determine compliance of replaced or additional work with specified requirements.

G. Prepare test and inspection reports.

3.5 REPAIRS

A. Repair precast structural concrete units if permitted by Architect.

1. Repairs may be permitted if structural adequacy, serviceability, durability, and appearance of units have not been impaired.

B. Mix patching materials and repair units so cured patches blend with color, texture, and uniformity of adjacent exposed surfaces and show no apparent line of demarcation between original and repaired work, when viewed in typical daylight illumination from a distance of 20 feet.

C. Prepare and repair damaged galvanized coatings with galvanizing repair paint according to ASTM A780.

D. Wire brush, clean, and paint damaged prime-painted components with same type of shop primer.

E. Remove and replace damaged precast structural concrete units that cannot be repaired or when repairs do not comply with requirements as determined by Architect.

3.6 CLEANING

A. Clean mortar, plaster, fireproofing, weld slag, and other deleterious material from concrete surfaces and adjacent materials immediately.

B. Clean exposed surfaces of precast concrete units after erection and completion of joint treatment to remove weld marks, other markings, dirt, and stains.

1. Perform cleaning procedures, if necessary, according to precast concrete fabricator's written recommendations. Protect other work from staining or damage due to cleaning operations.
2. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes or damage adjacent materials.

END OF SECTION 034100

SECTION 057500 – GRAPHIC PERFORATED ALUMINUM WALL PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Custom decorative metal wall panels.
2. Attachments and fasteners.

B. Related Items:

1. Wall Framing/Substrate

1.3 REFERENCES

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

1. ASTM B209 - 07 Standard Specifications for Aluminum and Aluminum-Alloy Sheet and Plate.

2. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.

1.4 SUBMITTALS

A. Drawings: For exterior screen panel assemblies and accessories. Include plans, elevations; sections and details describing complete assembly, including support framing and standoffs. Reference 3D geometry model for complex surfacing. Full scale design for artwork and custom generated perforated pattern.

B. Samples for initial selections:

1. Manufacturer’s color charts showing the full range of colors available for units with factory-applied color finishes.

2. One 12” x 12” sample of custom algorithmically generated perforated metal panel of the same material, hole size, and finish representing final product.

1.5 QUALITY ASSURANCE

A. Single-Source Responsibility: Provide panels and method of attachment by a single manufacturer.

B. Coordination of Work: Coordinate work with installers of related work including, but not limited to building structure, light fixtures, mechanical systems, electrical systems, and other substrates.

1.6 DELIVERY, STORAGE AND HANDLING

A. Store the metal panels, attachment/structure in an interior location and keep in cartons/crates prior to installation to avoid damage.

B. Exercise care in moving and opening cartons/crates to prevent damage to the panel face.

C. Handle panels carefully with manufacturer's recommendations to avoiddamaging parts in any way.

1.7 PROJECT CONDTIONS

A. Space Enclosure:

1. Building areas to receive panels shall be free of construction dust and debris. Products can be installed up to 100°F (38°C) with humidity not exceeding 90% RH. Cannot be used in exterior applications where standing water is present or where moisture will come in direct contact. Following installation, conditions must be maintained below 70% RH.

B. Warranty Period:

1. Panels: One (1) year from date of substantial completion.
2. Attachment devices: One (1) year from date of substantial completion.

C. Warranty Language:

1. Manufacturer's products are expressly warranted for a period of one (1) year from purchase to be free from defects in material and workmanship, when installed according to manufacturer's published installation procedures. During the warranty period manufacturer will repair or at its option replace the products that are proven to be defective. Manufacturer is NOT responsible for any intentional or accidental abuse, misuse, or neglect incurred on the original warranted product, and shall as determined by manufacturer, void the warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Custom Wall Panels:

1. Arktura – Gardena, CA
   Phone: 310.532.1050 Email:
   info@arktura.com

B. Attachment Devices for Custom Wall Panels:

1. Arktura – Gardena, CA
   Phone: 310.532.1050
   Email:
   info@arktura.com

2.2 PANEL UNITS

A. Samples for initial selections:

1. Surface Texture: Smooth (see Section 2.3).
2. Composition: Aluminum Alloy: 5052.
3. Color: RAL powder coated finish.
4. Custom Algorithmically Generated Perforation Pattern: Constantly varying hole sizes in multiples of .01". Holes/openings to vary from 200min to 500max unique diameters.
5. Pattern Constraints: Custom modified perforation pattern at all panel edges to accommodate pattern transitions and necessary material borders for material integrity.
6. All cuts/perforations 90Deg to surface face.
7. All metal bending and forming to be formed within a .03" bending tolerance.
8. No depressions or deformations at perforation edges.
9. Recycled Content: 25% (up to 75% recycled content upon request).

2.3 SURFACE FINISH

A. Application of surface finish to be applied in compliance with the following standard operating procedure:

1. Inspect raw material for obvious defects. Finish to 180 grit.
2. 7-stage anti-corrosion pretreatment.
3. Electrostatically apply Triglycidyl Isocyanurate (TGIC) polyester powder (Akzo Nobel D2000 or equivalent) to entire surface of part at approximately 2.0-3.0 mils. Exterior Architectural grade powder coating.
4. Cure part per manufacturer's specifications.

B. Surface finish, when complete, must meet the reference standards as listed below. American Society for Testing and Materials (ASTM):

1. ASTM D3359 Standard Test Methods for Measuring Adhesion, Method B.

2. ASTM D3363 Standard Test Method for Film Hardness by Pencil Test.
3. ASTM D2794 (modified) Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
4. ASTM D522 (modified) Standard Test Methods for Mandrel Bend Test of Attached Organic Coatings.
5. ASTM D4060 (modified) Standard Test Method for Abrasion Resistance.

C. Durability of surface finish must meet the reference standards as listed below. American Society for Testing and Materials (ASTM):

1. ASTM B117 - 09 Standard Practice for Operating Salt Spray (Fog) Apparatus.
2. AAMA 2604 – 5 Year South Florida Exposure (American Architectural Manufacturers Association, AAMA).

2.4 ATTACHMENT SYSTEM

A. Installation:

1. The custom engineered, prefabricated panels will be designed with countersunk holes spaced to align aesthetically with support framing beyond. Stainless Steel fasteners will be provided to attach panel through countersunk holes to custom fabricated standoff structure beyond. Some attachments will be fabricated for operability and be coordinated with specific attachment standoffs. Fastener heads will be flush with face of metal panels and will be coated to match color and finish of panel.

PART 3 - EXECUTION

3.1 PREPARATION

A. Field verify each wall area and establish layout of panels. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation. Panel substructure shall be level and plumb. Panel substructure shall be structurally sound as determined by that subcontractor’s engineer. Panel substructure shall be free of defects detrimental to work and erected in accordance with established building tolerances.

B. Coordinate panel layout with mechanical, electrical and sprinkler fixtures as required.

C. Coordinate delivery of such items to project site.

3.2 INSTALLATION

A. Install panels in accordance with the manufacturer’s instructions and in compliance with the authorities having jurisdiction.

B. Erect panels’ level and plumb, in proper alignment in relation to substructure framing and established lines.

C. Panel anchorage shall be structurally sound and per engineering recommendations.

D. Locate and place wall panels' level, plumb, and at indicated alignment with adjacent work.

3.3 ADJUSTING AND CLEANING

A. Replace damaged and broken panels.

B. Proper maintenance and regular servicing of the coated surfaces are both prerequisites for the claims of any guarantee and require regular cleaning at least once each year. For severe environmental pollution, for example in regions with increased salt contamination and/or chemical exhausts, meaning in a direct area of influence or within the vicinity of an industrial or chemical enterprise, or in the immediate vicinity of a sea coast or within a defined chemical/radioactive precipitation zone, the building must be cleaned more often. In this way possible damage can be made subject to timely recognition and remedied on time by suitable measures.

C. If a coated component is soiled during transport, through storage or assembly, the cleaning of this component must take place immediately with clear, cold or lukewarm water. Neutral or a weak alkaline detergent can be used against severe soiling.

D. Protect wall panel assemblies from damage during construction. Use temporary protective coverings where needed as approved by the wall panel manufacturer.

END OF SECTION 057500

SECTION 066400 - PLASTIC PANELING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plastic sheet paneling.
2. Factory-laminated plastic sheet paneling.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood furring for installing plastic paneling.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For plastic paneling and trim accessories, in manufacturer's standard sizes.

1.3 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install plastic paneling until spaces are enclosed and weathertight and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain plastic paneling and trim accessories from single manufacturer.

2.2 PLASTIC SHEET PANELING

A. Glass-Fiber-Reinforced Plastic Paneling: Gelcoat-finished, glass-fiber-reinforced plastic panels complying with ASTM D5319.
   1. Surface-Burning Characteristics: As follows when tested by a qualified testing agency in accordance with ASTM E84. Identify products with appropriate markings of applicable testing agency.
      a. Flame-Spread Index: 25or less.
      b. Smoke-Developed Index: 450 or less.

2. Nominal Thickness: Not less than 0.09 inch.
3. Surface Finish: Smooth
4. Color: White
5.

2.3 ACCESSORIES

A. Trim Accessories: Manufacturer's standard one-piece vinyl extrusions designed to retain and cover edges of panels. Provide division bars, inside corners, and caps as needed to conceal edges.

1. Color: White

B. Exposed Fasteners: Nylon drive rivets recommended by panel manufacturer.

C. Concealed Mounting Splines: Continuous, H-shaped aluminum extrusions designed to fit into grooves routed in edges of factory-laminated panels and to be fastened to substrate.

D. Adhesive: As recommended by plastic paneling manufacturer.

E. Sealant: sealant recommended by plastic paneling manufacturer and complying with requirements in Section 079200 "Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove wallpaper, vinyl wall covering, loose or soluble paint, and other materials that might interfere with adhesive bond.

B. Prepare substrate by sanding high spots and filling low spots as needed to provide flat, even surface for panel installation.

C. Clean substrates of substances that could impair adhesive bond, including oil, grease, dirt, and dust.

D. Condition panels by unpacking and placing in installation space before installation according to manufacturer's written recommendations.

E. Lay out paneling before installing. Locate panel joints to provide equal panels at ends of walls not less than half the width of full panels.

3.3 INSTALLATION

A. Install plastic paneling according to manufacturer's written instructions.

B. Install panels in a full spread of adhesive.

C. Install panels with fasteners. Layout fastener locations and mark on face of panels so that fasteners are accurately aligned.

1. Drill oversized fastener holes in panels and center fasteners in holes.
2. Apply sealant to fastener holes before installing fasteners.

D. Install factory-laminated panels using concealed mounting splines in panel joints.

E. Install trim accessories with adhesive Do not fasten through panels.

F. Fill grooves in trim accessories with sealant before installing panels, and bed inside corner trim in a bead of sealant.

G. Maintain uniform space between panels and wall fixtures. Fill space with sealant.

H. Maintain uniform space between adjacent panels and between panels and floors, ceilings, and fixtures. Fill space with sealant.

I. Remove excess sealant and smears as paneling is installed. Clean with solvent recommended by sealant manufacturer and then wipe with clean dry cloths until no residue remains.

END OF SECTION 066400

SECTION 071113 - SELF-ADHERING SHEET WATERPROOFING FOR USE AS A TRANSITION MEMBRANE

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. The General Conditions, the Supplementary Conditions, the Instructions to Bidders and Division One General Requirements shall be read in conjunction with and govern this section.

B. The Specification shall be read as a whole by all parties concerned. Sectioning of the Specification is for convenience. Each Section may contain more or less than the complete work of any trade. The Contractor is solely responsible to make clear to the Subcontractors the extent of their work.

1.2 DESCRIPTION

A. Supply labor, materials, plant, tools and equipment to complete the Work as shown on the Drawings and as specified herein including, but not limited to the following:

1. Transition Membrane between Pre-applied sheet membrane under steam trench slab and hot applied waterproofing on concrete steam trench walls and lids.
2. Primer & Self-Adhered SBS Modified Asphalt Waterproofing Membrane,
3. Drain Board/Protection Board

1.3 RELATED WORK

A. Concrete Forms and Accessories: Section 031000

B. Cast-in-Place Concrete: Section 033000

C. Pre-Applied Sheet Membrane Waterproofing: Section 071350

D. Hot Applied Rubberized Asphalt Waterproofing: Section 071413

1.4 REFERENCES

A. CAN/CGSB-37.9M: Primer, Asphalt, Unfilled for Asphalt Roofing, Dampproofing and Waterproofing.

1.5 SUBMITALS

A. Prior to commencing the Work, submit copies of manufacturer’s current certification to ISO. Membrane, primers, sealants, adhesives and associated auxiliary materials shall be included.

B. Prior to commencing the Work submit manufacturers complete set of standard details for waterproofing systems.

1.6 QUALITY ASSURANCE

A. Perform work in accordance with the printed requirements of the membrane manufacturer and this specification. Advise designer of any discrepancies prior to commencement of the Work.

B. Maintain one copy of manufacturer's literature on site throughout the execution of the Work.

C. At the beginning of the Work and at all times during the execution of the Work, allow access to site by the waterproofing membrane manufacturer's representative.

D. Materials used in this Section, including, primers, mastics and membranes, asphaltic protection boards, composite drainage boards and expansion joint membranes shall be fully compatible and shall be sourced and or produced by one manufacturer.

E. Submit copies of the membrane manufacturer's current ISO certification including the manufacturing of the membrane, primer, mastics, adhesives and protection board.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the job site in undamaged and original packaging indicating the name of the manufacturer and product.

B. Cold applied elastomeric membrane should be stored in closed containers outdoors.

C. Store membrane at temperature of 40 degrees F and above to facilitate handling.

D. Membrane contains petroleum solvents and are flammable. Do not use near open flame.

E. Store role materials horizontally in original packaging.

F. Store adhesives and primers at temperatures of 40 degrees F and above to facilitate handling.

G. Keep solvents away from open flame or excessive heat.

1.8 CO-ORDINATION

A. Ensure continuity of the waterproofing membrane throughout the scope of this section.

B. Work shall be so scheduled as to provide a watertight seal at the end of each working day on the areas worked upon during the day.

1.9 SITE CONDITONS

A. Environmental Requirements

1. No installation work shall be performed during rainy or inclement weather and on frost or wet covered surfaces.

B. Protection

1. Provide adequate protection of materials and work of this section from damage by weather backfilling operations and other causes.
2. Protect work of other trades from damage resulting from work of this section. Make good such damage at own expense to satisfaction of the consultant.
3. Apply protection board as soon as possible after installation of membrane.

1.10 ALTERNATES

A. The basis of design product referenced in this specification was specifically chosen for it's ability to bond with the pre-applied membrane below the trench slab as well as the hot applied rubberized asphalt product above on the walls and lids. Without this transition membrane, the pre-applied membrane will be severely damaged by the heat of the rubberized asphalt. Requests for substitutions must include a manufacturer's guarantee that the alternate products submitted can meet this intent. Refer to Division 1 specifications for substitution request procedures.

B. Alternate submission format to include:

1. Submit evidence that alternate materials meet or exceed performance characteristics of Product requirements and documentation from an approved independent testing laboratory certifying that the performance of the waterproofing membrane system including drain boards and transition sheets, exceed the requirements of the National Building Code.
2. Submit copies of manufacturers' current ISO certification.
3. Submit references clearly indicating that the membrane manufacturer has successfully completed projects on an annual basis of similar scope and nature for a minimum of fifteen years.
4. Submit manufacturers' complete set of standard details for the waterproofing membrane systems showing a continuous plane of water tightness throughout the building envelope.

C. Submit requests for alternate to this specification a minimum of ten (10) working days prior to tender closing for evaluation. Include a list of 25 projects executed over the past fifteen years.

D. Acceptable alternates will be confirmed by addendum. Substitute materials not approved in writing prior to tender closing shall not be permitted for use on this project.

1.11 WARRANTY

A. For the Work of this Section, the waterproofing installer must maintain a leak coverage warranty of 60 months.

B. Waterproofing membrane manufacturer hereby warrants that the waterproofing membrane for leak coverage as a result of faulty materials for a period of ten years. Scope of warranty shall include materials required to return the membrane to a watertight condition.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Waterproofing membrane components and accessories must be obtained as a single-source from the membrane manufacturer to ensure total system compatibility and integrity.

1. Acceptable Manufacturer: Henry Company.
909 N Sepulveda Blvd, Suite 650
El Segundo, CA 90245
(800) 598 7663
Web Site: www.Henry.com

2.2 WATERPROOFING MEMBRANE (Basis-of-Design)

A. Primary sheet applied self-adhered waterproofing membrane shall be Blueskin® WP200 manufactured by Henry, 1.5mm (60 mils) SBS modified bitumen, self-adhering sheet membrane with a cross-laminated polyethylene film, and having the following physical properties:

1. Thickness: 1.5 mm (60 mils) min.,
2. Flexibility: Pass @ -40 degrees C to ASTM D1970,
3. Vapour permeance: 2.8 ng/Pa.s.m² (0.05 perms) to ASTM E96,
4. Tensile strength (membrane): 2.24 MPa to ASTM D412,
5. Tensile strength (film): 34.5 MPa to ASTM D882,
6. Elongation: 300% to ASTM D412,
7. Puncture resistance: 222 N min. to ASTM E154.

2.3 PRIMER

A. Primer for self-adhering membranes at temperatures above 25 degrees F shall be Aquatac™ Primer manufactured by Henry, a polymer emulsion-based adhesive, quick setting, having the following physical properties:

1. Colour: Aqua;
2. Weight: 8.7 lbs/gal;
3. Solids by weight: 53%;

4. Water based, no solvent odours
5. Drying time (initial set): 30 minutes at 50% RH and 70 degrees F;

2.4 LIQUID MEMBRANE & TERMINATION SEALANT

A. Termination Sealant shall be HE925 BES Sealant manufactured by Henry; a moisture cure, medium modulus polymer modified sealing compound having the following physical properties:

1. Compatible with sheet air barrier, roofing and waterproofing membranes and substrate,
2. Complies with Fed. Spec. TT-S-00230C, Type II, Class A
3. Complies with ASTM C 920, Type S, Grade NS, Class 25
4. Elongation: 450 – 550%
5. Remains flexible with aging
6. Seals construction joints up to 1 inch wide

2.5 PREFABRICATED DRAIN BOARDS

A. Henry DB 520: For vertical installations along trench walls.

B. Henry G100 S/S: For horizontal installations over trench lids.

2.6 PREFABRICATED DRAIN BOARD ACCESSORIES

A. Securement Bars: Continuous 1/4 inch x 3/4 inch HDPE bar for screw attachment.

B. Molding Strip: Continuous 3 ½ inch wide ‘Z’ flashing strip to fit over exposed top edge of drain board.

C. Drain Board Plugs & Nails: HDPE pre-moulded washer to fit dimples c/w high strength, corrosion resistant concrete nails, UCAN AFH 37 or equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that surfaces and conditions are ready to accept the Work of this section. Commencement of the work or any parts thereof shall mean acceptance of the prepared substrate.

3.2 PREPARATION

A. All surfaces must be sound, dry, clean and free of oil, grease, dirt, excess mortar, frost or other contaminants. Fill imperfections in substrate to provide an even plane.

B. New concrete should be cured for a minimum of 7 days and must be dry before waterproofing membranes are applied. Lightweight structural concrete must be cured a minimum of 14 days.

C. Use appropriate waterproofing membrane primer as recommended by manufacturer based on air and surface temperature at time of application.

3.3 PRIMER

A. Apply primer for self-adhered membrane by roller or spray at rate recommended by manufacturer.

B. Allow minimum 30-minute open time. Primed surfaces not covered by waterproofing membrane during the same working day must be re-primed.

3.4 FOOTING/FOUNDATION WALLS, JUNCTURES, CRACKS IN SLAB AND PROTRUSIONS

A. Coat penetrations, such as brackets, clips, braces, etc. that are set into the concrete with a 90 mil coating of liquid membrane to the height of the wearing course and around projections to ensure a complete seal prior to coating the entire area.

B. To all cracks and cold joints less than 1/16 inch, apply a coat of liquid membrane at a minimum thickness of 30 mils extending 3 inches on either side of joint, embed a 6 inch wide strip of primary self-adhered waterproofing membrane over.

C. To all cracks greater than 1/8 inch, fill void with non-shrink cementitious patching material and allow to cure dry. Prime area and install self-adhered waterproofing membrane, extend 3 inches on either side of crack. Overlap end joint of sheet a minimum 3 inches.

D. At monolithic and non-monolithic wall/slab junctures, prime area, trowel-in fillet bead of liquid membrane to inside corners and install self-adhered waterproofing membrane sheet to the required height on the wall and at least 4 inches on the slab. Lap primary waterproofing membrane over a minimum of 2 inches.

E. Horizontal to vertical inside corner transition areas are to be pre-treated with a liquid membrane fillet extending 3/4 inch vertically and horizontally from the corner. Apply a minimum 10 inch strip of self-adhered waterproofing membrane centred at the joint.

F. All outside corners are to be pre-treated with a minimum 10 inch strip of waterproofing membrane centred at the joint.

G. Where three or more planes come into contact reinforce with cut sections of waterproofing membrane reinforcing sheet as per manufacturer’s instructions.

3.5 PROJECTIONS

A. Extend waterproofing membrane tight to projection and seal with liquid membrane extending 3 inches along projection and 3 inches onto waterproofing membrane.

3.6 WATERPROOFING MEMBRANE - VERTICAL APPLICATIONS

A. Apply waterproofing membrane to prepared substrate in lengths of 6 feet or less.

B. Provide 3 inch laps at both sides and ends. Position for alignment and remove protective film. Press firmly into place. Promptly roll all laps with a counter top roller to effect seal. If more than one length is required on a vertical surface, apply in a shingle fashion.

C. Terminate membrane using termination mastic or termination bar, reglet or counter flashing as indicated. Refer to manufacturers standard details.

D. All laps within 12 inches of a 90 degrees change in plane are to be sealed with termination sealant.

3.7 INSTALLATION OF PROTECTION BOARD

A. Protection Boards shall be installed over the waterproofing membrane to prevent damage from materials used in backfilling.

B. Apply protection board adhesive in 1 inch wide strips spaced at 16 inches o/c to cure waterproofing membrane. Immediately embed protection board and press into adhesive to ensure full contact.

C. Do not backfill until adhesive has cure dried. Do not use excessive levels of adhesive.

3.8 INSTALLATION OF DRAINAGE BOARD (VERTICAL)

A. Align and hang drainage up to foundation wall. Position bottom edge of drainage board to be in moderate contact with weeping tile system.

B. Secure drainage board to foundation wall with nails and washers spaced 450 mm o/c horizontally. Install minimum of 2 rows staggered and spaced 6 inches apart and min 6 inches from top edge.

C. Align and install termination strip along top edge with nails spaced 12 inches o/c and seal with termination sealant.

D. Align and install moulding strip over completed top edge detail.

E. Overlap end laps, pull back loose fabric to expose drain core and position core of second panel over the overlap flange of first panel.

F. Bend drain board to create inside corners and cut board to create outside corners, provide 4 inches of extra fabric to wrap corner.

G. Stagger or of set joints of drain board sheets.

H. Place all subsequent sheets in an overlapping single fashion.

I. Backfill bottom edge in conjunction with weeping tile system.

3.9 INSTALLATION OF DRAINAGE BOARD (HORIZONTAL)

A. The edge of the core flange shall be at the higher edges of the substrate, away from drains.

B. Overlap in the direction of water flow. Pull back loose fabric to expose drain core and position core of second panel over the overlap flange of first panel.

C. Bend drain board to create inside corners and cut board to create outside corners, provide 3 inch of extra fabric to wrap corner.

D. Stagger or offset joints of drain board sheets.

E. Place all subsequent sheets in an overlapping single fashion.

3.10 CLEAN-UP

A. Promptly as the work proceeds and on completion clean up and remove from site all rubbish and surplus materials resulting from the foregoing work.

3.11 PROTECTION

A. Protect waterproofing membrane and drain board work from other trades during construction.

B. Backfill with specified materials, protect membrane from damage.

END OF SECTION 071113

SECTION 079100 – PREFORMED JOINT SEALS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Preformed, foam joint seals.
2. Preformed, Multi-cable transits

B. Related Requirements:

1. Section 079200 "Joint Sealants" for liquid sealants applied over preformed seals in dual-seal systems.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Preformed, foam joint seals.
2. Extruded-silicone joint seals.

B. Samples for Initial Selection: Manufacturer's color sheets, showing full range of available colors for each type of exposed preformed joint seal.

C. Samples for Verification: Actual samples of each type and color of exposed preformed joinseal.

1. Size: 1/2-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint seals.

D. Preformed Joint Seal Schedule: Include the following information:

1. Joint seal location and designation.
2. Joint width and movement capability.
3. Joint seal manufacturer and product name.
4. Joint seal color.

1.4 INFORMATIONAL SUBMITTALS

A. Test and Evaluation Reports: Samples for Verification:

1. Product Test Reports: For each preformed joint seal, for tests performed by qualified testing agency.

B. Sample warranties.

1.5 WARRANTY

A. Special Installer's Warranty: Installer agrees to repair or replace preformed joint seals that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer agrees to furnish preformed joint seals to repair or replace those that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. For preformed joint seals, obtain each color, type, and variety of joint seal from single source with resources to provide products of consistent quality in appearance and physical properties.

2.2 PREFORMED, FOAM JOINT SEALS

A. Preformed, Foam Joint Seals: Manufacturer's standard joint seal manufactured from urethane or EVA (ethylene vinyl acetate) foam with minimum density of 10 lb/cu. ft. and impregnated with a nondrying, water-repellent agent. Factory produce them in precompressed sizes in roll or stick form to fit joint widths based on design criteria indicated, with factory- or field-applied adhesive for bonding to substrates.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Willseal LLC; or comparable product by one of the following:

a. Construction Specialties, Inc.
b. Inpro Corporation.
c. Schul International Company, LLC.

2. Design Criteria:

a. Nominal Joint Width: As indicated on Drawings.

b. Movement Capability: As indicated on Drawings.

3. Joint Seal Color: As selected by Architect from full range of industry colors.

B. Preformed multi-cable fire rated transit
1. Basis-of-Design Product: Roxtec S
a. Fire Rated 1 hour
b. Water Tight
c. Gas/Smoke Tight

2.3 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by preformed joint seal manufacturer for joint substrates

indicated.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to preformed joint seal manufacturer, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces, and formulated to promote best adhesion to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with preformed joint seals and surfaces adjacent to joints.

D. Sealant for Adhering Extruded-Silicone Joint Seals: Silicone adhesive sealant recommended by extruded-silicone joint seal manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive preformed joint seals, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting preformed joint seal performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing preformed joint seals to comply with preformed joint seal manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of preformed joint seal, including dust, paints (except for permanent protective coatings

tested and approved for seal adhesion and compatibility by seal manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimal bond with preformed joint seals. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

    a. Concrete.
    b. Masonry.

3. Remove laitance and form-release agents from concrete.

4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint seals. Nonporous joint substrates include the following:

    a. Metal.
    b. Glass.

B. Joint Priming: Prime joint substrates where recommended by preformed joint seal manufacturer or as indicated by tests or prior experience. Apply primer to comply with joint seal manufacturer's written instructions. Confine primers to areas of joint seal bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of adhesive or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF PREFORMED, FOAM JOINT SEALS

A. General: Comply with preformed joint seal manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.

1. Install each length of seal immediately after removing protective wrapping.
2. Firmly secure compressed joint seals to joint gap side to obtain full bond using exposed pressure-sensitive adhesive or field-applied adhesive as recommended by manufacturer.
3. Do not pull or stretch material. Produce seal continuity at splices, ends, turns, and intersections of joints.
4. For applications at low ambient temperatures, heat foam joint seal material in compliance with manufacturer's written instructions.

3.4 INSTALLATION OF EXTRUDED-SILICONE JOINT SEALS

A. General: Comply with preformed joint seal manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.

1. Apply masking tape to each side of joint, outside of area to be covered by seal system.

2. Apply silicone sealant to each side of joint to produce a bead of size complying with preformed silicone seal system manufacturer's written instructions and covering a bonding area of not less than 3/8 inch. Hold edge of sealant bead 1/4 inch inside masking tape.
3. Press silicone extrusion into sealant to wet extrusion and substrate. Use a roller to apply consistent pressure and ensure uniform contact with substrate.
4. Complete installation of seal system in horizontal joints before installing in vertical joints. Lap vertical joints over horizontal joints. At ends of joints, cut silicone extrusion with a razor knife.

3.5 INSTALLATION OF PREFORMED MULTI-CABLE TRANSITS

A. General: Comply with preformed joint seal manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply

B. Coordinate with cable quantity and floor/wall penetration to provide transit. Ensure transit has 50% additional capacity.

3.6 PROTECTION

A. Protect preformed joint seals from damage resulting from construction operations or other causes so seals are without deterioration or damage at time of Substantial Completion.

B. Cut out, remove, and repair damaged or deteriorated seals so repaired areas are indistinguishable from original work.

END OF SECTION 079100

SECTION 099113 - EXTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Primers.
2. Finish coatings.
3. Floor sealers and paints.

B. Related Requirements:

1. Section 051200 "Structural Steel Framing" for shop priming of metal substrates.
2. Section 055000 "Metal Fabrications" for shop priming metal fabrications.
3. Section 055213 "Pipe and Tube Railings" for shop priming pipe and tube railings.
4.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include preparation requirements and application instructions.
2. Indicate VOC content.

B. Samples: For each type of topcoat product.

C. Product Schedule: Use same designations indicated on Drawings and in the Exterior Painting Schedule to cross-reference paint systems specified in this Section. Include color designations.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Paint Products: 5 percent, but not less than 1 gal. of each material and color applied.

1.5 QUALITY ASSURANCE

A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system.

a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft.
b. Other Items: Architect will designate items or areas required.

2. Final approval of color selections will be based on mockups.

a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Sherwin Williams. (Basis of Design)
2. Benjamin Moore & Co.

3. PPG Paints
4. Cloverdale Paint.

B. Source Limitations: Obtain each paint product from single source from single manufacturer.

2.2 PAINT PRODUCTS, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another, and substrates indicated, under conditions of service and application as demonstrated by manufacturer based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by topcoat manufacturer for use in paint system and on substrate indicated.

B. Colors: As indicated in a finish schedule

2.3 PRIMERS

A. Exterior, Alkali-Resistant, Water-Based Primer: Pigmented, water-based primer formulated for use on alkaline surfaces, such as exterior plaster, vertical concrete, and masonry.

B. Water-Based, Rust-Inhibitive Primer: Corrosion-resistant, water-based-emulsion primer formulated for resistance to flash rusting when applied to cleaned, exterior ferrous metals subject to mildly corrosive environments.

C. Quick-Drying, Alkyd Metal Primer: Corrosion-resistant, solvent-based, modified-alkyd primer; lead and chromate free; formulated for quick-drying capabilities and for use on cleaned, exterior steel surfaces.

D. Water-Based, Galvanized-Metal Primer: Corrosion-resistant, pigmented, acrylic primer; formulated for use on cleaned/etched, exterior, galvanized metal to prepare it for subsequent water-based coatings.

2.4 METAL PRIMERS

A. Alkyd Anticorrosive Metal Primer: MPI #79.

1. VOC Content: E Range of E2.
2. Products: Provide one of the following:

    a. 661 Interior Exterior Alkyd Primer as manufactured by Frazee Paint CGI.
    b. 1710-120 Alkyd Rust Inhibitive Primer as manufactured by Kelly-Moore.

3. Quick-Drying Alkyd Metal Primer: MPI #76.

    a. VOC Content: E Range of E2 or E3.
    b. Product: Provide one of the following:

1) 661 Metal Prime as manufactured by Frazee Paint CGI.
2) 330 Q.D. Alkyd Rust Inhibitive Primer as manufactured by Hallman Lindsay.

4. Waterborne Galvanized-Metal Primer: MPI #134

a. VOC Content: E Range of E3.
b. Products: Provide one of the following:

1) 703 Series EcoLogic Rustex Primer as manufactured by Cloverdale Paint.
2) MC series Acrylic Maintenance Primer Finish as manufactured by Diamond Vogel.

a) 4020 Devflex as manufactured by ICI Paint (Canada).
b) 1821 Galvanized Iron Primer as manufactured by Parker Paint CGI.
c) 4800 Metal Pro – White as manufactured by Vista Paint.

B. Exterior Alkyd Paints.

1. Exterior Alkyd Enamel (Semigloss): MP #94 (Gloss Level 5). Provide Classic 99 Exterior Semi-Gloss Oil # a40w51 as manufactured by Sherwin Williams.

a. VOC Content: E Range of E1

C. Exterior Alkyd Enamel, Semigloss: Solvent-based, pigmented, alkyd enamel formulated for mold, microbial, and water resistance and for use on exterior, primed, wood and metal surfaces.

1. Gloss Level: Manufacturer's standard semigloss finish.

2.5 FLOOR SEALERS AND PAINTS

A. Water-Based, Concrete-Floor Sealer: Clear, water-based, acrylic-copolymer-emulsion sealer formulated for oil, gasoline, alkali, and water resistance and for use on exterior, concrete traffic surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.

C. Verify suitability of substrates, including surface conditions and compatibility, with finishes and primers.

D. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems specified in this Section.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

3.3 INSTALLATION

A. Apply paints in accordance with manufacturer's written instructions.

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
3. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
4. Paint entire exposed surface of window frames and sashes.
5. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
6. Primers specified in the Exterior Painting Schedule may be omitted on items that are factory primed or factory finished if compatible with intermediate and topcoat coatings and acceptable to intermediate and topcoat paint manufacturers.

B. Tint undercoats same color as topcoat but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Paint the following work where exposed to view:

a. Equipment, including panelboards.
b. Uninsulated metal piping.
c. Uninsulated plastic piping.
d. Pipe hangers and supports.
e. Metal conduit.
f. Plastic conduit.
g. Tanks that do not have factory-applied final finishes.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.

1. Contractor shall touch up and restore painted surfaces damaged by testing.
2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written instructions, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written instructions.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

1. Do not clean equipment with free-draining water and prevent solvents, thinners, cleaners, and other contaminants from entering into waterways, sanitary and storm drain systems, and ground.
2. Dispose of contaminants in accordance with requirements of authorities having jurisdiction.
3. Allow empty paint cans to dry before disposal.
4. Collect waste paint by type and deliver to recycling or collection facility.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 EXTERIOR PAINTING SCHEDULE

A. Concrete Substrates, Nontraffic Surfaces:

1. Latex System:

a. Prime Coat: Matching topcoat.
b. Intermediate Coat: Matching topcoat.
c. Topcoat: Exterior latex paint, semigloss.

B. Steel and Iron Substrates:

1. Alkyd System:

a. Prime Coat: Shop primer specified in Section in which substrate is specified.
b. Intermediate Coat: Matching topcoat.
c. Topcoat: Exterior alkyd enamel, semigloss.

C. Galvanized-Metal Substrates:

a. Prime Coat: Water-based, galvanized-metal primer.
b. Intermediate Coat: Matching topcoat.
c. Topcoat: Exterior, water-based, light industrial coating, semigloss.

END OF SECTION 099113

SECTION 099123 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Primers.
2. Water-based finish coatings.
3. Solvent-based finish coatings.
4. Floor sealers and paints.
5. Dry fall coatings.

B. Related Requirements:
1. Section 055000 "Metal Fabrications" for shop priming metal fabrications.
2. Section 055113 "Metal Pan Stairs" for shop priming metal pan stairs.
3. Section 055213 "Pipe and Tube Railings" for shop priming, painting pipe and tube railings.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

1. Include preparation requirements and application instructions.
1. Indicate VOC content.

B. Samples: For each type of topcoat product.

C. Product Schedule: Use same designations indicated on Drawings and in the Interior Painting Schedule to cross-reference paint systems specified in this Section. Include color designations.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Paint Products: 5 percent, but not less than 1 gal. of each material and color applied.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.6 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures of less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers:

1. Sherwin-Williams Company (Basis of Design for all manufacturing areas)
2. PPG paints; PPG Industries, Inc.
3. Kelly-Moore Paints.

B. Source Limitations: Obtain each paint product from single source from single manufacturer.

2.2 PAINT PRODUCTS, GENERAL

A. Material Compatibility:

1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

B. VOC Content: For field applications that are inside the weatherproofing system, verify paints and coatings comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:

1. Flat Paints and Coatings: 50 g/L.
2. Nonflat Paints and Coatings: 50 g/L.
3. Dry-Fog Coatings: 150 g/L.
4. Primers, Sealers, and Undercoaters: 100g/L.
5. Rust-Preventive Coatings: 100 g/L.
6. Zinc-Rich Industrial Maintenance Primers: 100 g/L.

7. Pretreatment Wash Primers: 420 g/L.
8. Shellacs, Clear: 730 g/L.
9. Shellacs, Pigmented: 550 g/L.

C. Colors: Refer to the Finish Schedule on the drawings.

2.3 PRIMERS

A. Interior/Exterior Latex Block Filler: Water-based, high-solids, emulsion coating formulated to bridge and fill porous surfaces of exterior concrete masonry units in preparation for specified subsequent coatings.

B. Interior Latex Primer Sealer: Water-based latex sealer used on new gypsum wallboard surfaces.

C. Interior, Institutional Low-Odor/VOC Primer Sealer: Water-based primer sealer with low-odor characteristics and a VOC of less than 10 grams per liter for use on new gypsum wallboard surfaces that are subsequently to be painted with latex finish coats.

D. Water-Based Galvanized-Metal Primer: Corrosion-resistant, acrylic primer; formulated for use on cleaned/etched, exterior, galvanized metal to prepare it for subsequent water-based coatings.

B. Water-Based Bonding Primer: Water-based-emulsion primer formulated to promote adhesion of subsequent specified coatings.

2.4 WATER-BASED FINISH COATS

A. Interior, Latex, Eggshell: Pigmented, water-based paint for use on primed/sealed interior plaster and gypsum board, and on primed wood and metals.

1. Gloss and Sheen Level: Manufacturer's standard eggshell finish.

B. Interior, Latex, Satin: Pigmented, water-based paint for use on primed/sealed interior plaster and gypsum board, and on primed wood and metals.

1. Gloss and Sheen Level: Manufacturer's standard low-sheen finish.

C. Interior, Latex, Semigloss: Pigmented, water-based paint for use on primed/sealed interior plaster and gypsum board, and on primed wood and metals.

1. Gloss Level: Manufacturer's standard semigloss finish.

D. Interior, Latex, Gloss: Pigmented, water-based paint for use on primed/sealed interior plaster and gypsum board, and on primed wood and metals.

1. Gloss Level: Manufacturer's standard gloss finish.

2.5 SOLVENT-BASED FINISH COATS

A. Interior, Alkyd, Semigloss: Pigmented, solvent-based alkyd paint for use on primed/sealed interior metal surfaces.

1. Gloss Level: Manufacturer's standard semigloss finish.

B. Interior, Alkyd, Gloss: Pigmented, solvent-based alkyd paint for use on primed/sealed interior metal surfaces.

1. Gloss Level: Manufacturer's standard gloss finish.

2.6 FLOOR SEALERS AND PAINTS

A. Water-Based Concrete Floor Sealer: Clear, water-based, acrylic-copolymer-emulsion sealer formulated for oil, gasoline, alkali, and water resistance and for use on concrete traffic surfaces.

2.7 DRY FALL COATINGS

A. Dry Fall, Latex, Flat: Pigmented, water-based, emulsion-type, fast-drying coating for use on interior plaster, concrete, gypsum board, primed wood, and metal ceilings.

1. Gloss and Sheen Level: Manufacturer's standard flat finish.

B. Dry Fall, Latex, Eggshell: Pigmented, water-based, emulsion-type, fast-drying coating for use on interior plaster, concrete, gypsum board, primed wood, and metal ceilings.

1. Gloss and Sheen Level: Manufacturer's standard eggshell finish.

C. Dry Fall, Latex, Semigloss: Pigmented, water-based, emulsion-type, fast-drying coating for use on interior plaster, concrete, gypsum board, primed wood, and metal ceilings.

2. Gloss Level: Manufacturer's standard semigloss finish.

D. Water Based, Dry Fall for Galvanized Steel, Flat: Pigmented, water-based coating for direct application to cleaned, interior galvanized-metal ceiling surfaces and adjacent primed metals.

3. Gloss and Sheen Level: Manufacturer's standard flat finish.

E. Water Based, Dry Fall for Galvanized Steel, Eggshell: Pigmented, water-based coating for direct application to cleaned, interior galvanized-metal ceiling surfaces and adjacent primed metals.

4. Gloss and Sheen Level: Manufacturer's standard eggshell finish.

C. Water Based, Dry Fall for Galvanized Steel, Semigloss: Pigmented, water-based coating for direct application to cleaned, interior galvanized-metal ceiling surfaces and adjacent primed metals.

1. Gloss Level: Manufacturer's standard semigloss finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Masonry (Clay and CMUs): 12 percent.
3. Gypsum Board: 12 percent.

F. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

C. Spray-Textured Ceiling Substrates: Verify that surfaces are dry.

D. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.

E. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.

F. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer**.**

G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

3.3 INSTALLATION

A. Apply paints according to manufacturer's written instructions.

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Fire-Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Paint the following work where exposed in equipment rooms:

a. Equipment, including panelboards.
b. Uninsulated metal piping.
c. Uninsulated plastic piping.
d. Pipe hangers and supports.
e. Metal conduit.
f. Plastic conduit.
g. Tanks that do not have factory-applied final finishes.
a. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.

2. Paint the following work where exposed in occupied spaces:

    a. Equipment, including panelboards.
    b. Uninsulated metal piping.
    c. Uninsulated plastic piping.
    d. Pipe hangers and supports.
    e. Metal conduit.
    f. Plastic conduit.
    g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
    b. Other items as directed by Architect.

3. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 FIELD QUALITY CONTROL

A. Dry-Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry-film thickness.

1. Contractor shall touch up and restore painted surfaces damaged by testing.
2. If test results show that dry-film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry-film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

1. Do not clean equipment with free-draining water and prevent solvents, thinners, cleaners, and other contaminants from entering into waterways, sanitary and storm drain systems, and ground.
2. Dispose of contaminants in accordance with requirements of authorities having jurisdiction.
3. Allow empty paint cans to dry before disposal.
4. Collect waste paint by type and deliver to recycling or collection facility.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE

A. Concrete Substrates, Nontraffic Surfaces:

1. Latex System:

a. Prime Coat: Alkali-resistant, water-based primer.
b. Intermediate Coat: Matching topcoat.
c. Topcoat: Interior latex paint, refer to finish schedule.

2. Alkyd System:

a. Prime Coat: Alkali-resistant, water-based primer.
b. Intermediate Coat: Matching topcoat.
c. Topcoat: Interior alkyd, refer to the Finish Schedule.

B. Concrete Substrates, Traffic Surfaces:

1. Water-Based Concrete Floor Sealer System:

a. First Coat: Matching topcoat.
b. Topcoat: Water-based concrete floor sealer.

C. CMU Substrates:

1. Latex System:

a. Block Filler: Interior/exterior latex block filler.
b. Intermediate Coat: Matching topcoat.
c. Topcoat: Interior, latex; refer to the Finish Schedule.

D. Metal Substrates in all manufacturing areas: (Sherwin Williams DTM Acrylic, Basis of Design)

1. Pro Industrial DTM Acrylic System, Alkyd Primer:

a. Prime Coat: Alkyd quick-dry primer for metal.

1) S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 series at 5.0 to 10 mils wet, 5.0 to 4.0 mils dry.

b. Intermediate Coat: Water-based acrylic, matching topcoat.
c. Topcoat: Water-based acrylic, semi-gloss:

1) S-W Pro Industrial Semi-Gloss Coating, B66-650 Series at 2.5 to 4.0 mils dry, per coat. Refer to the Finish Schedule.

2. Topcoat: Water-based acrylic, gloss:

a. S-W Pro Industrial Gloss Coating, B66-650 Series at 2.5 to 4.0 mils dry, per coat. Refer to the Finish Schedule.

3. Latex over Shop-Applied Quick-Drying Shop Primer System:

    c. Prime Coat: Quick-dry primer for shop application.
    d. Intermediate Coat: Matching topcoat.
    e. Topcoat: Interior, latex, Refer to the Finish Schedule.

4. Water-Based Dry-Fall System:

    a. Prime Coat: Alkyd quick-dry primer for metal
    b. Topcoat: Refer to the Finish Schedule.

5. Alkyd System:

    a. Prime Coat: Alkyd quick-dry primer for metal
    c. Intermediate Coat: Matching topcoat.
    d. Topcoat: Interior, alkyd, Refer to the Finish Schedule.

6. Alkyd Dry-Fall System:

    a. Prime Coat: Alkyd quick-dry primer for metal
    b. Topcoat: Alkyd, dry fall, Refer to the Finish Schedule.

E. Galvanized-Metal Substrates:

1. Latex System:

    a. Prime Coat: Water-based galvanized primer.
    b. Intermediate Coat: Matching topcoat.
    b. Topcoat: Interior, latex, Refer to the Finish Schedule.

2. Alkyd Dry-Fall System (Cementitious Primer):

    a. Prime Coat: Cementitious galvanized primer.
    b. Topcoat: Alkyd, dry fall, Refer to the Finish Schedule.

F. Gypsum Board Substrates:

1. Latex over Latex Sealer System:

    a. Prime Coat: Interior latex primer sealer.
    b. Intermediate Coat: Matching topcoat.
    c. Topcoat: Interior, latex, Refer to the Finish Schedule.

END OF SECTION 099123

SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Public-use washroom accessories.
2. Toilet-compartment occupancy-indicator system.
3. Public-use shower room accessories.
4. Private-use bathroom accessories.
5. Healthcare accessories.
6. Childcare accessories.
7. Underlavatory guards.
8. Custodial accessories.
9. Hand-sanitizer dispensers.

B. Related Requirements:

1. Section 088300 "Mirrors" for frameless mirrors.
2. Section 093013 "Ceramic Tiling" for ceramic toilet and bath accessories.
3. Section 102813.63 "Detention Toilet Accessories" for accessories designed for installation in detention facilities.

1.2 ALLOWANCES

A. See Section 012100 "Allowances" for description of allowances affecting items specified in this Section.

1.3 UNIT PRICES

A. See Section 012200 "Unit Prices" for description of unit prices affecting items specified in this Section.

1.4 ALTERNATES

A. See Section 012300 "Alternates" for description of alternates affecting items specified in this Section.

1.5 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.6 ACTION SUBMITTALS

A. Product Data:

1. Public-use washroom accessories.
2. Toilet-compartment occupancy-indicator system.
3. Public-use shower room accessories.
4. Private-use bathroom accessories.
5. Healthcare accessories.
6. Childcare accessories.
7. Underlavatory guards.
8. Custodial accessories.
9. Hand-sanitizer dispensers.

B. Product Data Submittals: For each product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
3. Include electrical characteristics.

C. Samples: For each exposed product and for each finish specified, full size.

1. Approved full-size Samples will be returned and may be used in the Work.

D. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1. Identify locations using room designations indicated.
2. Identify accessories using designations indicated.

E. Delegated Design Submittals: For [**grab bars**] [**and**] [**shower seats**].

1. Include structural design calculations indicating compliance with specified structural-performance requirements.

1.7 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For manufacturer's special warranties.

1.8 CLOSEOUT SUBMITTALS

A. Maintenance Data: For accessories to include in maintenance manuals.

1.9 WARRANTY

A. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, visible silver spoilage defects.
2. Warranty Period: [**10**] [**15**] <**Insert number**> years from date of Substantial Completion.

B. Manufacturer's Special Warranty for Toilet-Compartment Occupancy-Indicator Systems: Manufacturer agrees to repair or replace toilet-compartment occupancy-indicator systems that fail in materials or workmanship within specified warranty period.

1. Warranty Period: [**Five**] <**Insert number**> years from date of Substantial Completion.

C. Manufacturer's Special Warranty for Hand Dryers: Manufacturer agrees to repair or replace hand dryers that fail in materials or workmanship within specified warranty period.

1. Warranty Period: [**Two**] [**Five**] [**10**] <**Insert number**> years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 OWNER-FURNISHED MATERIALS

A. Owner-Furnished Materials: <**Insert products**>.

2.2 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Structural Performance: Design accessories and fasteners to comply with the following requirements:

1. Grab Bars: Installed units are able to resist 250 lbf (1112 N) concentrated load applied in any direction and at any point.
2. Shower Seats: Installed units are able to resist [**250 lbf (1112 N)**] [**360 lbf (1601 N)**] <**Insert load**> concentrated load applied in any direction and at any point.

2.3 PUBLIC-USE WASHROOM ACCESSORIES

A. Source Limitations: Obtain [**public-use washroom accessories**] [**each type of public-use washroom accessory**] from single source from single manufacturer.

B. Toilet Tissue (Roll) Dispenser <**Insert drawing designation**>:

1. <Double click here to find, evaluate, and insert list of manufacturers and products.>

2. Description: [**Roll-in-reserve dispenser with hinged front secured with tumbler lockset**] [**Single-roll dispenser**] [**Double-roll dispenser**] [**Double-roll dispenser with shelf**] <**Insert description**>.
3. Mounting: [**Recessed**] [**Partition mounted, serving two adjacent toilet compartments**] [**Surface mounted**].
4. Operation: [**Noncontrol delivery with standard spindle**] [**Noncontrol delivery with theft-resistant spindle**] [**Spindleless with tension-spring controlled delivery**] [**Spindleless with tension-spring controlled delivery and self-locking device extending through core that prevents core removal until roll is empty**] [**Eccentric-shaped, molded-plastic spindle revolves one-half revolution per dispensing operation for controlled delivery; core cannot be removed until roll is empty**] <**Insert description**>.
5. Capacity: Designed for [**4-1/2- or 5-inch- (114- or 127-mm-)**] [**5-inch- (127-mm-)**] <**Insert dimension**> diameter tissue rolls.
6. Material and Finish: [**Stainless steel, ASTM A480/A480M No. 4 finish (satin)**] [**Chrome-plated zinc alloy (zamac) or steel**] [**Satin-finish aluminum bracket with plastic spindle**] <**Insert material and finish**>.

C. Combination Toilet Tissue Dispenser <**Insert drawing designation**>:

1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
2. Description: Combination unit with double-roll toilet tissue dispenser and the following:

    a. Removable sanitary-napkin waste receptacle with self-closing, disposal-opening cover.
    b. Seat-cover dispenser with minimum capacity of [**500**] [**1000**] <**Insert number**> single or half-fold seat covers.

3. Mounting: [**Recessed**] [**Surface mounted**] [**Partition mounted, dual access with two tissue rolls per compartment**] [**Partition mounted, dual access with two tissue rolls per compartment and with one side that mounts flush with partition of accessible compartment**].
4. Toilet Tissue Dispenser Capacity: [**4-1/2- or 5-inch- (114- or 127-mm-)**] <**Insert dimension**> diameter tissue rolls.
5. Toilet Tissue Dispenser Operation: [**Noncontrol delivery with theft-resistant spindles**] <**Insert description**>.
6. Material and Finish: [**Stainless steel, ASTM A480/A480M No. 4 finish (satin)**] <**Insert material and finish**>.
7. Lockset: Tumbler type.

D. Toilet Tissue (Jumbo-Roll) Dispenser <**Insert drawing designation**>:

1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
2. Description: [**One-roll unit**] [**Two-roll unit with sliding panel to expose other roll**].
3. Mounting: Surface mounted.
4. Capacity: [**9- or 10-inch- (228- or 254-mm-)**] <**Insert dimension**> diameter rolls.
5. Material and Finish: [**Stainless steel, ASTM A480/A480M No. 4 finish (satin)**] [**ABS plastic, gray, with translucent front cover**] <**Insert material and finish**>.
6. Lockset: Tumbler type.
7. Refill Indicator: Pierced slots at front.

E. Paper Towel (Folded) Dispenser <**Insert drawing designation**>:

1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
2. Mounting: [**Recessed**] [**Semirecessed**] [**Deck mounted, recessed**] [**Surface mounted**].
3. Minimum Capacity: [**400 C-fold or 525 multifold towels**] [**600 C-fold or 800 multifold towels**] [**400 single-fold towels**] <**Insert capacity**>.
4. Material and Finish: [**Stainless steel, ASTM A480/A480M No. 4 finish (satin)**] [**ABS plastic, gray**] <**Insert material and finish**>.
5. Lockset: Tumbler type.
6. Refill Indicator: Pierced slots at sides or front.

F. Paper Towel (Roll) Dispenser <**Insert drawing designation**>:

1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
2. Description: [**Lever-actuated**] [**Pull-towel-actuated**] mechanism that permits controlled delivery of paper rolls in preset lengths.
3. Mounting: [**Recessed**] [**Semirecessed**] [**Surface mounted**].
4. Minimum Capacity: [**8-inch- (203-mm-) wide, 800-foot- (244-m-) long roll**] <**Insert capacity**>.
5. Material and Finish: [**Stainless steel, ASTM A480/A480M No. 4 finish (satin)**] [**ABS plastic, gray, with translucent front cover**] <**Insert material and finish**>.
6. Lockset: Tumbler type.

G. Automatic Paper Towel (Roll) Dispenser <**Insert drawing designation**>:

1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
2. Description: Automatic motion-sensing mechanism with user-adjustable delay and paper towel length; [**electrically operated, with adapter for 110 to 240 V ac power supply**] [**battery powered**] <**Insert description**>.
3. Mounting: [**Recessed**] [**Semirecessed**] [**Surface mounted**].
4. Minimum Capacity: [**8-inch- (203-mm-) wide, 800-foot- (244-m-) long roll**] <**Insert capacity**>.
5. Material and Finish: [**Stainless steel, ASTM A480/A480M No. 4 finish (satin)**] [**ABS plastic, gray**] <**Insert material and finish**>.
6. Lockset: Tumbler type.

H. Waste Receptacle <**Insert drawing designation**>:

1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
2. Mounting: [**Open top, recessed**] [**Self-closing disposal-opening cover, recessed**] [**Semirecessed**] [**Surface mounted**] [**Wall mounted for corner installation**] [**Freestanding**] [**Undercounter**] <**Insert description**>.
3. Minimum Capacity: <**Insert value**>.
4. Material and Finish: [**Stainless steel, ASTM A480/A480M No. 4 finish (satin)**] <**Insert material and finish**>.
5. Liner: [**Reusable vinyl liner**] <**Insert liner description**>.
6. Lockset: Tumbler type for waste receptacle.

I. Countertop-Mounted Circular Waste Chute <**Insert drawing designation**>:

1. <Double click here to find, evaluate, and insert list of manufacturers and products.>

SECTION 224100 - PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Lavatories.
2. Lavatory faucets.
3. Water closets.
4. Toilet seats.
5. Supply fittings.
6. Waste fittings.
7. Grout.

1.2 DEFINITIONS

A. FRP: Fiberglass-reinforced plastic.

B. PMMA: Polymethyl methacrylate, also known as "acrylic."

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for lavatories.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Counter cutout templates for mounting of counter-mounted plumbing fixtures.

B. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For plumbing fixtures and faucets to include in emergency, operation, and operation and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Faucet Washers and O-Rings: Equal to 10 percent of amount of each type and size installed.
2. Faucet Cartridges and O-Rings: Equal to 5 percent of amount of each type and size installed.
3. Flushometer-Tank Repair Kits: Equal to 5 percent of amount of each type installed, but no fewer than two of each type.
4. Toilet Seats: Equal to 5 percent of amount of each type installed.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Standards:

1. Domestic water valves intended to convey or dispense water for human consumption must comply with the SDWA, requirements of authorities having jurisdiction, and NSF 61 and NSF 372, or must be certified to be in compliance with NSF 61 and NSF 372 (by an ANSI-accredited third-party certification body) that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

2.2 LAVATORIES - COUNTER MOUNTED

A. Vitreous-China Lavatories:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. American Standard.
b. Crane Plumbing, LLC; a division of American Standard.
c. Kohler Co.
d. Sloan Valve Company.
e. Sterling.

B. Fixture:

1. Standard:
a. ASME A112.19.2/CSA B45.1 for vitreous-china lavatories.

2. Type: Flat rim with ledge.
3. Round Nominal Size: 15-3/4” in diameter.
4. Faucet-Hole Location: None.
5. Color: White.

2.3 LAVATORY FAUCETS

A. NSF Standard: Comply with NSF 61 and NSF 372 for faucet materials that will be in contact with potable water.

B. General-Duty, Solid-Brass Lavatory Faucets:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Standard.
b. Bradley Corporation.
c. Elkay.
d. Zurn Industries, LLC.
e. Kohler Co.

C. Description: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture holes; coordinate outlet with spout and fixture receptor.

D. Standard: ASME A112.18.1/CSA B125.1.

E. Body Material: General duty, solid brass.

F. Finish: Polished chrome plate.

G. Maximum Flow Rate: 1.2 gpm (4.5 L/min).

H. Centers: 4 inches Single hole.

I. Mounting: Deck, exposed.

J. Valve Handle(s): Elbow.

K. Inlet(s): NPS 1/2 male shank.

L. Spout: Rigid.

M. Spout Outlet: Plain end.

N. Operation: Compression, manual.

O. Drain: Pop up.

2.4 WATER CLOSETS

A. Water Closets: Floor mounted, floor outlet, close coupled (gravity tank), vitreous china, 1.1 (4L)/flush to 1.6 gal./flush.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. American Standard.
    b. Eljer, Inc.
    c. Kohler Co.
    d. Zurn Industries, LLC.
2. Bowl:

    a. Standards: ASME A112.19.2/CSA B45.1, ASME A112.19.5/CSA B45.15, and ASSE 1037/ASME A112.1060/CSA B125.16.
    b. Bowl Type: Siphon jet.
    c. Height: Standard.
    d. Rim Contour: Elongated.
    e. Water Consumption: Water saving.
    f. Color: White.
3. Supply Fittings:

    a. Standard: ASME A112.18.1/CSA B125.1.
    b. Supply Piping: Chrome-plated-brass pipe or chrome-plated-copper tube matching water-supply piping size. Include chrome-plated wall flange.
    c. Stop: Chrome-plated-brass, one-quarter-turn, ball-type or compression stop with inlet connection matching water-supply piping type and size.

        1) Operation: Loose key.

    d. Riser:
        1) Material: ASME A112.18.6/CSA 125.6, braided- or corrugated-stainless steel flexible hose riser.

2.5 TOILET SEATS

A. Toilet Seats:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. American Standard.
    b. Church Seats; Bemis Manufacturing Company.
    c. Eljer, Inc.
    d. Zurn Industries, LLC.

2. Standard: IAPMO Z124.5/ANSI Z124.5.
3. Material: Plastic.
4. Type: Commercial (Heavy Duty)
5. Shape: Elongated rim (Open front).
6. Configuration: Open front without cover.
7. Size: Elongated.
8. Hinge Type: Check.

9. Hinge Material: Plastic.
10. Seat Cover: Not required.
11. Color: White.

2.6 SUPPLY FITTINGS

A. NSF Standard: Comply with NSF 61 and NSF 372 for faucet materials that will be in contact with potable water.

B. Standard: ASME A112.18.1/CSA B125.1.

C. Bidet Lavatory Bar Sink Kitchen Sink and Laundry Tray Supply Fittings:

1. Supply Piping: Chrome-plated-brass pipe or chrome-plated-copper tube matching water-supply piping size. Include chrome-plated wall flange.
2. Stops: Chrome-plated-brass, one-quarter-turn, ball-type or compression stop with inlet connection matching water-supply piping type and size.

    a. Operation: Loose key.

3. Risers:

    a. Size:

        1) NPS 3/8 for lavatories.

    b. Material: ASME A112.18.6/CSA B125.6, braided- or corrugated-stainless-steel flexible hose riser.

2.7 WASTE FITTINGS

A. Standard: ASME A112.18.2/CSA B125.2.

B. Drain:

1. Grid type with NPS 1-1/4 offset tailpiece for accessible lavatories.
2. Pop-up type with NPS 1-1/4 straight tailpiece as part of faucet for standard lavatories.

C. Trap:

1. Size:

    a. NPS 1-1/2 by NPS 1-1/4or NPS 1-1/2 for lavatories.

2. Material:

    a. Chrome-plated, two-piece, cast-brass trap and ground-joint swivel elbow with 0.032-inch-thick brass tube to wall; and chrome-plated-brass or -steel wall flange.

2.8 GROUT

A. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000 psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water-supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before plumbing-fixture installation.

B. Examine walls, floors, cabinets, and counters for suitable conditions where fixtures will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF RESIDENTIAL PLUMBING FIXTURES

A. Install plumbing fixtures level and plumb in accordance with roughing-in drawings.

B. Install floor-mounted water closets on closet flange attachments to drainage piping.

C. Install counter-mounting fixtures in and attached to casework.

D. Install pedestal lavatories on pedestals and secured to wood blocking in wall.

E. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.

1. Use ball or gate valves if supply stops are not specified with fixture. Comply with valve requirements specified in Section 220523.12 "Ball Valves for Plumbing Piping."

F. Install tanks for accessible, tank-type water closets with lever handle mounted on wide side of compartment.

G. Install toilet seats on water closets.

H. Install faucet flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

I. Install shower flow-control fittings with specified maximum flow rates in shower arms.

J. Install traps on fixture outlets.

1. Omit trap on fixtures with integral traps.
2. Omit trap on indirect wastes unless otherwise indicated.

K. Install disposer in outlet of each sink indicated to have a disposer. Install switch where indicated or in wall adjacent to sink if location is not indicated.

L. Install hot-water dispensers in back top surface of sink or in countertop with spout over sink.

M. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories and sinks. Comply with requirements in Section 220719 "Plumbing Piping Insulation."

N. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220500 "Common Work Results for Plumbing."

O. Seal joints between plumbing fixtures, counters, floors, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

3.3 PIPING CONNECTIONS

A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

D. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories and sinks. Comply with requirements in Section 220719 "Plumbing Piping Insulation."

3.4 ADJUSTING

A. Operate and adjust plumbing fixtures and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.

B. Adjust water pressure at faucets to produce proper flow.

3.5 CLEANING AND PROTECTION

A. After completing installation of plumbing fixtures, inspect and repair damaged finishes.

B. Clean plumbing fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.

C. Provide protective covering for installed plumbing fixtures and fittings.

D. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 224100

SECTION 260916 - ELECTRICAL CONTROLS AND RELAY PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes:

1. Indoor Enclosure for the following equipment to be installed at the University Substation:

    a. Substation Control.
    b. Controls and Relaying.
    c. Communications: Ethernet Switches.
    d. I/O Panel.
    e. Auxiliaries.

1.3 REFERENCES

A. All equipment shall meet or exceed the latest editions of the applicable standards listed below.

1. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
2. IEEE C37.2 - "Electrical Power System Device Function Numbers, Acronyms, and Contact Designations".
3. IEEE C37.21 - "Control Switchboards" (copyrighted by IEEE, ANSI approved).
4. ANSI/IEEE C37.90 - "Relays and Relay Systems Associated with Electric Power Apparatus" (copyrighted by IEEE, ANSI approved).
5. IEEE C57.13 – “IEEE Standard Requirements for Instrument Transformers”
6. IEEE C37.90 - Relays and Relay Systems Associated with Electric Power Apparatus.
7. IEEE-1613: Environmental and Testing Requirements for Communications Networking Devices Installed in Electric Power Substations
8. IEEE-C37.90: Relays and Relay Systems Associated with Electric Power Apparatus
9. IEC 60068-2: Environmental Tests
10. IEC 60255-21: Vibration and shock Tests
11. IEC-60255-22: RFI and Interference Tests
12. IEC 60825-1: Laser (LED) Safety
13. IEC-61000-4: Electromagnetic Compatibility
14. IEC-61000-6: Electromagnetic Compatibility
15. IEC-61850 Series: Communication Networks and Systems for Power Utility Automation
16. CFR 47 Parts 15 and 18, Code of Federal Regulations - Federal Communications Commission (FCC) Rules and Regulations pertaining to EMI

B. National Fire Protection Association (NFPA):

1. NFPA 70 - "National Electrical Code" (copyrighted by NFPA, ANSI approved) hereinafter referred to as NEC.
2. NFPA 70B - "Recommended Practice for Electrical Equipment Maintenance" (copyrighted by NFPA, ANSI approved).
3. NFPA 70E – “Standard for Electrical Safety In The Workplace” (copyrighted by NFPA, ANSI approved) hereinafter referred to as NEC.
4. Underwriters Laboratories, Inc. (UL):
   a. UL 486A-B - "UL Standard for Safety Wire Connectors

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's product data showing material and equipment proposed.

1. Product data shall include, but shall not be limited to, the following equipment and materials:

   a. Electrical Cabinets.
   b. Control, Relaying, and Metering equipment.
   c. HMI Panel with programming software door mounted.
   d. Networking equipment.
   e. Wire and cable.

2. The ratings for the equipment shall include, but shall not be limited to, the following:

   a. Voltages.
   b. Frequency.
   c. Number of phases.
   d. Current, continuous, and interrupting.
   e. Accuracy.
   f. Power requirements.
   g. Power losses at full and half load.

3. Physical characteristics and materials shall include, but shall not be limited to, the following:

   a. Size/dimensions.
   b. Weight.
   c. Finishes.

4. Accessories shall include, but shall not be limited to, the following:

   a. Indicating lights.
   b. Terminal blocks.
   c. Test switches.
   d. Auxiliary contacts.

B. Shop Drawings: Submit complete shop drawings for approval Shop drawings shall include, but shall not be limited to, the following:

1. Bill of materials and components.
2. Outline drawings, dimensioned plans, elevations, sections, supports, materials, and finishes, showing weights, bolt spacing, clearances, tolerances, conduit, cable entrances, terminal strips, and methods of assembly.
3. Cubicle and compartment layouts.
4. Nameplate details (size and legend).
5. Detail drawings showing incoming location of cable termination with dimensions. Shop drawings shall verify sufficient conductor space and compliance with codes.
6. Shipping arrangements and packaging methods.

C. Wiring Diagrams: Submit with shop drawings, specific wiring diagrams and instructions for equipment, controls, or devices which are furnished or which are to be field wired and connected. The diagrams and instructions shall not be of a general or typical nature, but shall be applicable only to this Project. Include identical diagrams and instructions to install the equipment as are included in the operating and maintenance manuals. Wiring diagrams shall include, but shall not be limited to, the following:

1. Single line diagrams.
2. Electrical wiring diagrams for communications, instrumentation, metering and relaying.
3. Control schematic diagrams including interface diagrams having terminals identified for remote equipment.
    a. Indicate all field wires with Cable Tag, Size, Color, Equipment To, Equipment From per Jacobs cable schedule, in addition to Terminal Block, and Terminal Number where wire is to be landed. In the case that a cable is required but not indicated on Jacobs cable schedule, notify engineer and cable information shall be provided.
4. Wiring diagrams for communication sections showing field connections by others.

D. Calculations: Submit calculations supporting the selection of the devices and components furnished. Devices requiring submittal of calculations shall include, but shall not be limited to, the following:

1. DC Power System components.
2. Low Voltage AC Power system components.

E. Operating and Maintenance Manuals: Prepare and deliver complete operating and maintenance manuals. Provide information pertinent to the equipment for preventive maintenance and for replacement of expendable components. Manuals shall include the items listed below and other information recommended by the manufacturer:

1. Manufacturer's published information.
2. Set of shop drawings.
3. Wiring diagrams of electrical components.
4. Acceptance test reports.
5. Electrical characteristics and ratings of components.
6. Recommended spare parts list.
7. Maintenance Procedures
8. Complete list of parts.

F. Submit with proposals.

1. Preliminary Data Sheets.

2. Preliminary one-line diagrams.
3. Elevations showing overall dimensions, weights, and layout of accessories.
4. Complete list of spare parts and special tools that will be furnished with equipment, which are included in lump sum price. In addition, provide itemized price listing of recommended spare parts with prices guaranteed for at least 1 year after acceptance of equipment.
5. Complete data and listing of items requiring field assembly and installation and special equipment required.
6. Manufacturer's ISO certification certificate.
7. Location of manufacture of each unit.
8. Preliminary electrical one-line diagram of DC System.

G. Submit after Notice of Award

Table 1 lists required quantities and delivery times for submittals. Electronic format shall be digital (AutoCAD) copy, compatible with AutoCAD 2009, of final shop, schematic and wiring diagram drawings.

TABLE 1. QUANTITY, TYPE AND SCHEDULE FOR SUBMITTALS

TYPE OF DOCUMENTATION REQUIRED	FOR APPROVAL	REQUIRED NO. OF CALENDAR DAYS AFTER AWARD	AS-BUILT (APPROVED) DRAWINGS	REQUIRED NO. OF DAYS PRIORTO SHIPMENT
Outline Drawings	1/E	30	1/E	90
Floor plan drawing shown location for anchor bolts and leveling channels	1/E	30	1/E	90
Location of openings required for entrance of conduits and cables.	1/E	30	1/E	90
One-line diagrams	1/E	30	1/E	90
Certified Data Sheets	1/E	30	1/E	90
Master Drawing Index	1/E	30	1/E	90
Schematic Diagrams and Elementary wiring and connection diagrams	1/E	60	1/E	90
Material List with Manufacturer reference numbers	1/E	60	1/E	90
Ratings and Nameplate Schedules	1/E	45	1/E	90
Elevations showing overall dimensions, weights, and layout of accessories	1/E	45	1/E	90
Detailed instruction books for all equipment,	------	------	**3/N, 1/E	90

TABLE 1. QUANTITY, TYPE AND SCHEDULE FOR SUBMITTALS				
TYPE OF DOCUMENTATION REQUIRED	FOR APPROVAL	REQUIRED NO. OF CALENDAR DAYS AFTER AWARD	AS-BUILT (APPROVED) DRAWINGS	REQUIRED NO. OF DAYS PRIORTO SHIPMENT
meters, and each type of relay				
Certified test report of manufacturer's standard production tests	------	------	5/N, 1/E	90
List of Special Tools	------	------	1/E	90
Heating load and cooling load calculations	1/E	60	1/E	15
Detailed procedures and processes for factory acceptance tests	*1/N, 1/E	60	----------	----------
* Approval Not Required ** 1 Non-Reproducible Set Included with Each Building on Shipment N - Non-Reproducible; E - Electronic Format				

1.5 SYSTEM DESCRIPTION

A. Provide complete free-standing assemblies as shown on drawings to house equipment consisting of protective relays and control devices, AC and DC Power systems, Ethernet switches for communications and other accessories.

1.6 QUALITY ASSURANCE

A. After fabrication, perform an operational test in the manufacturer's plant to check out the entire system before delivery. Include calibration of meters, operation of relays, and device settings; control wiring, including polarity, of all instrument transformers; complete assembly and control function testing. Submit certified written test reports.

B. Provide written data certifying a minimum of ten years' experience in the building of electrical control and relay panels and at least ten successful working installations of this type of equipment.

1.7 WARRANTY

A. The manufacturer shall provide a warranty against defects in material and workmanship for a period of 3 years from the date of factory acceptance testing. During the first 3 years of operation,

there shall be no cost to the Owner for any corrective repairs. Individual component warranties may be longer and will be coordinated with manufacturer after the first 3 years of operation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Provide materials and equipment that are products of manufacturers regularly engaged in the production of such products which are of equal material, design, and workmanship, and have been in satisfactory commercial or industrial use for 2 years prior to bid opening including applications of equipment and materials under similar circumstances and of similar size.

2.2 GENERAL

A. Unless otherwise specified this equipment is intended for use in ambient temperatures that do not exceed a maximum of 40°C (104°F) or a minimum of -30°C (-22°F).

B. This equipment is intended for use in an area where the elevation is less than 3300 feet above sea level.

2.3 ENCLOSURE

A. Provide prefabricated enclosure per specification section 26 27 16. Enclosure shall house all items specified herein and shall be fully assembled and tested prior to shipment to site as discussed in Part 3.

B. Enclosure shall have solid sheet metal sides, top, and rear panels. Hinged lockable front door capable of supporting panel mounted style equipment, wireways, terminal blocks, and other devices. Equipment shall be mounted such that it will not interfere with the opening of front door and shall have a minimum 135 degree outward swing for access to rear of equipment and wiring. Enclosure shall have bottom entry access for cables.

1. Refer to drawings for additional information and basis of design enclosure dimensions.

    a. Equip enclosure with duplex receptacles with GFI, and LED lights. DC breaker shall be 2 pole with a minimum interrupting current rating of 10 KAIC.

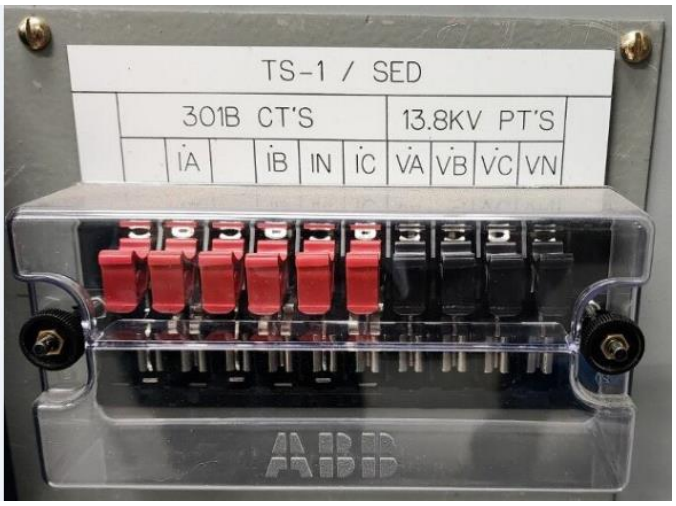
2. Mount instruments such as breakers, lights, meters, and pushbuttons that provide external interface on the front doors such that they are visible and accessible without opening doors or covers.
3. Provide the following features:

    a. LEDs for indicator lights.
    b. Mimic bus panel display:

        1) Primary Bus: Red.
        2) Nameplates and mimic bus screw fastened.

3) Manufacturer nameplate (engraved AL or SS) with Manufacture Date, order number, and Ratings. One for each vertical section.
4) Breaker Number: Orange w/ White lettering.
5) Circuit Description: Blue w/ White lettering.
6) Device: White w/ Black lettering. Refer to photo below for example.

7) FT Test Switches: White w/ Black lettering. Handles Red for Outputs/Trips and CT's, Black for all else. Refer to photo below for example:



2.4 NAMEPLATES

A. Nameplates shall be provided for each unit, instrument, transformer, light, meter, switch, control, terminal strip, rear panel mounted component (including fuses), fuse blocks, timers, relays, auxiliary relays, etc., in accordance with a nameplate schedule. Color coding shall be used for equipment and functional identification.

1. Nameplates color and material shall be per section 2.3.B.3.
2. Characters shall be uniform block style not smaller than 1/2 inch for switching devices, and panelboards, and not smaller than 1/4 inch for instrument transformers, relays, alarms, instruments, and control devices.
3. Nameplates shall be secured using No. 4, 36 RH stainless steel or nickel plated brass machine screws.

2.5 ACCESSORIES

A. Electronic Protective Relays and Controllers.

1. Relays: Protective relay shall be microprocessor type; meeting surge withstand requirements of ANSI/IEEE C37.90. Relay device number shall be in accordance with IEEE C37.2.

2. Relay and Controller Types:

a. SEL 3555 RTAC part number 3555#AQ68

1) Quantity: 1
2) Provide loose for rack mount in OT room.

b. SEL Axion part number 2240#8BJB

1) Quantity: 2

2) Mounted in I/O panel.

c. SEL 2488 Satellite clock part number 24880PAX1281AX23X

1) Provide installation kit included in part number. Install antenna and cabling per details on drawings and manufacturers instructions.
2) Quantity: 1
3) Provide loose for rack mount in OT room.

d. SEL 311L part number 0311L13DD3254X4XX

1) Quantity: 2
2) Mounted in relay protection panel.

e. SEL 411L part number 0411L0X4X5C8D0X3524D4XX

1) Quantity: 2
2) Mounted in relay protection panel.

f. SEL 735 part number 0735LX20944EXXXXXX16201CX

1) Quantity: 2
2) Mounted in relay protection panel.

g. SEL 487E part number 0487E3X411XXC1X43624XXX

1) Quantity: 2
2) Mounted in relay protection panel.

h. SEL 2731 network switch sales item number 2731#229K.

1) Quantity: 6
2) Provide loose for rack mount in OT room.

i. Electro Industries Shark 250 meter part number Shark250-60-10-V2-D2-INP100S

1) Quantity: 1
2) Mounted in relay protection panel.

3. The relays shall be capable of directly interfacing with the SCADA system over Ethernet. The relays shall meet the following performance requirements:

a. Standards: Shall meet applicable IEEE C37.90 standards.
b. Alarm Contact: Normally closed contact (contact closed if loss of power or self-check failure).
c. As a minimum, relays shall have the capability of transmitting current, trip, and status information to a power monitoring central computer.

4. Refer to drawings for wiring information.

B. SCADA Desktop Computer.

1. Install owner furnished Desktop Computer.
2. Provide all cables necessary for the installation to function correctly.
3. Install in control room per drawings.

C. Lockout Relays.

1. Electroswitch Type LOR Series 24, part number as indicated on Contract Drawing.
2. Integral LEDs:

    a. Lockout relay coil intact and ready – White.
    b. Lockout relay trip applied – Red.
    c. Rated operating trip voltage shall be low enough to allow coil operation at 75% of rated voltage.

3. Part number indicates number of decks, and therefore number of contacts.

D. Breaker Control switches.

1. Electroswitch Series 24.

    a. Rated operating trip voltage shall be low enough to allow coil operation at 75% of rated voltage.
    b. Pistol Grip handle.

E. Local/Remote Switch.

1. Electroswitch Series 24.

    a. Oval Shank handle.
    b. Contacts: Minimum 4 N.C. and 4 N.O, wired to terminal blocks for owner’s use.

F. Circuit Breaker status lights (LED):

1. Open (Green).
2. Closed (Red).

G. Trip Coil Monitor:

1. SEL 2652 Trip Coil Monitor SEL Part Number 2652B5XX.

    a. Trip Coil healthy LED: Blue.
    b. Alarm contacts for trip coil discontinuity.
    c. Quantity: 6.
    d. Mounted in relay protection panel.

H. Test Switches

1. Provide test switches with stud terminals for metering and for all relays.

    a. Knife blade test switch: 10-pole with Control Power, Voltage and Current elements as required, clear cover, ABB "Flexitest" Type FT-1, or equal.

b. Identify each voltage and each pair of current switches with a "V" or "I" and phase designation "A," "B," or "C" or 'G' with an engraved nameplate. (See example photo of test switch below-next page).
c. All test switches wired to current transformers shall be shorting type switch which shorts out the CT, make before break, when the switch is operated.

2. Extend 3-phase bus voltage circuits to all cubicles and combine with metering current transformer circuits on common test block for use with OWNER's portable instruments.
3. Lockout test switches: 10 single-pole potential elements, cover, wired in series with coils and normally open contacts of lockout relays, ABB"Flexitest" Type FT-1, or equal.
4. Covers: Clear cover, shallow cover with thumbnuts.

I. Transformer LTC Remote position indication:

1. Provide two (2) synchro-rotary position indicators for LTC position indication (one per transformer).

a. Incon Model RD-4.

2.6 WIRING

A. Class B for stranding and flexibility for all control wiring, No. 14 AWG minimum (Current transformer wiring #10 AWG minimum).

B. Wiring over door hinges or other locations where leads may be subject to flexing shall employ the use of No. 14 AWG (minimum), 41 strand, extra flexible copper conductors.

C. Ring tongue type lugs connected on all control wiring except relay connections (wire ferrule for relay connections).

D. Terminal block connections used shall be GE Type EB=25 or similar style with terminal marking strip in the middle of the block. All current transformers terminal blocks (SCTB) shall be GE type EB-27 and shall terminate immediately into shorting terminal blocks with knurled conductive thumbscrews (one in each corner) for shorting out the current transformer. All CT taps shall be wired out to SCTB.

E. All wiring shall utilize mechanical fastening means only. The use of adhesives for fastening wiring to the panel or the use of adhesives for any purpose is not permitted.

F. Terminations:

1. Wiring shall not have more than two wires connected to a terminal point.

a. Only one wire shall terminate on "phoenix" type connectors. (Back of SEL relays for example).

2. External wiring termination points for Owner's connections shall be arranged for one wire to each terminal point.
3. Twenty percent (20%) spare terminal points shall be provided.

4. Terminal blocks shall be furnished and installed at panel splits or shipping splits for wiring reconnection at the jobsite. Shipping split connections shall be clearly tagged.

G. Wire Markings: Every wire shall have source and destination identification which shall be visible at each termination point. All wire marker identification shall use typewritten text. Wire markers shall be heat shrinkable or plastic interlocking sleeve type. The marker shall not be heat-shrinked in order to be able to turn the marker to get a better view of the marking. Cloth wire markers are not acceptable. Spare contacts on relays, lockout relays, control switches, etc., shall be assigned wire numbers, wired to terminal blocks, and labeled accordingly.

H. Methods: Hinge wiring shall be arranged so that any twisting shall take place in the longitudinal plane of the conductor, rather than across the conductor.

2.7 DC OVERCURRENT PROTECTION AND WIRING

A. All DC-fusing shall be ganged, + and -, in dead-front, “finger safe” shot-gun style pull-out type with lighted blown fuse indication visible from the front of the fuseblock.

B. Customer provided DC circuit(s) shall terminate on finger safe disconnect switch then distributed to the individual breaker cubicles.

2.8 EXTRA MATERIALS

A. Touch up paint: Provide 1 quart of each color used.

B. Spare fuses: 10% of each style and rating installed.

C. Spare Indicating lights: Provide 2 of each color installed.

D. Terminal Blocks: Provide 2 of each size and style installed.

2.9 QUALITY CONTROL

A. Factory Test: Panel shall be completely assembled, wired, and functionally tested at the factory in accordance with NETA ATS, latest edition, and NFPA 70B. The factory tests shall include, but shall not be limited to, the following:

1. Functional Tests: The intent of functional tests is to prove the proper interactions of sensors, instruments, protective devices, communications equipment, and control system so as to ensure total system operating capability. Local, remote, and interlocking control modes shall be tested. The manufacturer shall provide devices necessary to simulate such control for test purposes. Device operation, control and interlock operation, protective operations, and alarm and status system activation shall be tested and verified. All protective relays to undergo acceptance testing, commissioning and primary and secondary current injection testing.
2. Witnesses: Manufacturer shall allow for three (3) representatives of the Owner to witness testing of the equipment.

2.10 MANUFACTURER FIELD SERVICES

A. Provide services of competent factory-based service engineer for the coordination and connection of building components.

B. Provide manufacturer's field service for complete system startup services.

C. Provide a competent factory service organization that is available for service on a 24 hour call basis for duration of warranty period.

PART 3 - EXECUTION

3.1 CONTRACTOR RECEIPT AND EXAMINATION

A. Contractor on site, will receive and install the Panels in accordance with manufacturer’s requirements and as directed by Manufacturer’s Field Representative.

3.2 IDENTIFICATION

A. Provide warning signs as specified in Section 26 05 53.

B. Diagram and Instructions:

1. Storage for Maintenance: Include a rack or holder, near the equipment, for a copy of maintenance manual.

3.3 DEMONSTRATION

A. Demonstrate to Owner's maintenance personnel how to adjust, operate, and maintain all associated auxiliary systems.

3.4 DATA SHEETS

A. If values submitted by manufacturer are estimated, Data Sheets shall be updated and resubmitted after values are known.

B. Data Sheets may require information that will not be known until engineering is complete. Data shall be estimated based on good engineering judgment for similar projects completed, and so indicated on the data sheets indicating “est.” next to data.

C. Do not leave items blank or label “To Be Determined”, or “Later”. Do not submit manufacturer product data sheets in place of Data Sheets

END OF SECTION 260916